Risk & Policy: The relevance and influence of Aaron Wildavsky's book *Searching for Safety* in the safety discourse

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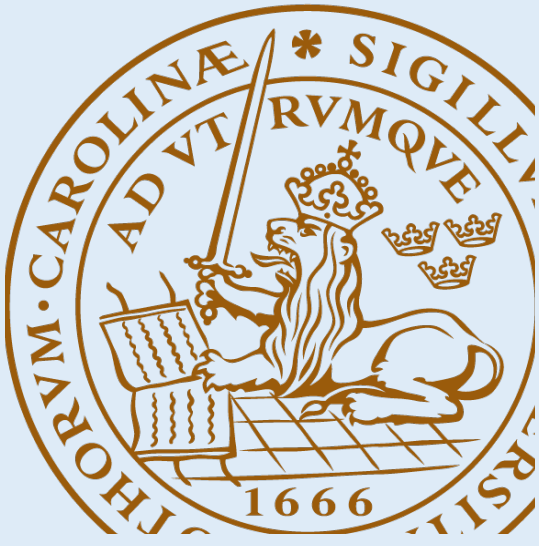

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Abstract
The main finding of this thesis is that the relevance and influence of Aaron Wildavsky's book *Searching for Safety* in today's safety discourse is limited although Wildavsky may be considered to be the linking pin between RE, HRO and NAT. The safety discourse may benefit from Wildavsky's work in political science: I.e., dealing with social power within organizations, the use of net benefit in risk assessment and resilience as a means to determine the economics of safety in the global safety debate.

The research further shows that, 45 years after publication of the book, the key message of the book is still, and has even become more, relevant in this modern Western society. Hereby considering the complexity and interconnectedness, the ongoing application of the precautionary principle, the demise of neo-liberalism and neo-conservatism and imminent societal changes.

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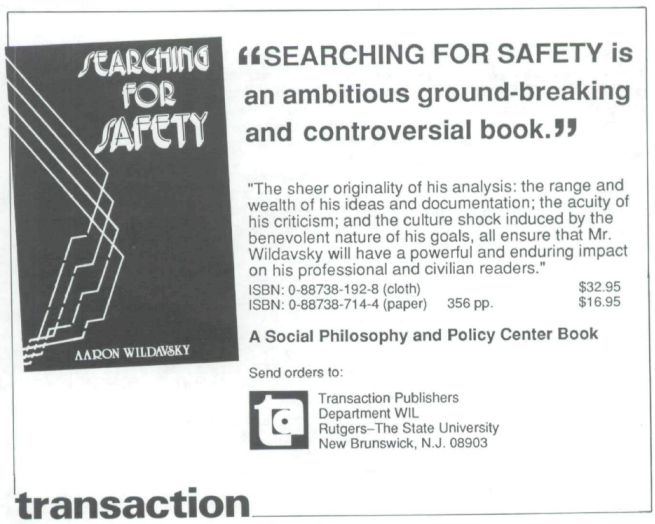
Introduction

Searching for Safety (Wildavsky, 1988a) was advertised as "an ambitious ground-breaking and controversial book" (Wildavsky, 1989a, p. 5) (Figure 1). It was a response to the imposed regulation by the US government to ensure public Environment and Health & Safety (EHS) protection, what Wildavsky calls "the anticipation strategy"; trying to foresee all known risk instead of being resilient. Wildavsky promoted a risk-taking approach which was, and still is, not common in public policy, health & safety regulation and safety discourse (Wildavsky, 1988a).

Figure 1

Advertisement for Searching for Safety



The underpinning concepts of resilience as described and favoured by Wildavsky are almost identical to resilience, as described by the 'new view concept' safety thinkers within the safety discourse as identified by Le Coze (2022), such as: Cognitive Systems Engineering (CSE) as initiated by Rasmussen, Hollnagel and Woods, the succeeding Resilience Engineering (RE) school of thought, Hollnagel's Safety II and Dekker's view on human error, to name but a few. The difference between these concepts is that Wildavsky's book was published in 1988 with ideas from the 1970s and early '80s based on political science (Wildavsky, 1988a). The 'new view concepts' emerged early 21st century based on Rasmussen ideas that emerged at the same time as Wildavsky's. Within RE (as part of the 'new view concepts'), *Searching for Safety* appears to be considered as the genesis of their movement (Herrera, 2023).

This might be considered peculiar, since Wildavsky is recognised as an influential and famous political scientist, and not so much as a 'safety thinker.' *Searching for Safety* was written as a response to the overregulation by the US government towards EHS protection in the late 1970s and '80s. Therefore, the book might be considered as an alternative policy, or even a political statement, rather than a 'safety science' book (Wildavsky, 1988a). Is it because of the word safety in the title that it is considered being a 'safety science' book, or is there more than meets the eye: the underpinning concepts of resilience versus anticipation? This thesis will therefore explore the relevance and influence[1] of *Searching for Safety* in the safety discourse.

Reading guidance

The thesis will begin with the research methodology where the research question and research design will be explained. This is followed by the literature review. The findings and analysis are presented in separate chapters. Firstly, the author and the book will be discussed, followed by cultural theory, political science, the emergence of EHS legislation, resilience, and societal risk to explain the context. This is continued with an exploration of the safety discourse, and the book's influence therein. A discussion chapter is next, including the determination of the relevance of *Searching for Safety* by discussing three societal risk debates about nuclear energy, the use of chemicals including PFAS,[2] and the introduction of drugs and medicines. Furthermore, critiques and context, the role of political science in the safety discourse, the application of anticipatory & resilience strategies, and what Wildavsky could 'have been' will be discussed. Thereafter, the thesis is concluded.

[1] With relevance is meant the relation to the matter at hand, in this case the safety discourse (Merriam-Webster, n.d.). With influence is meant the power or capacity of causing an effect in indirect or intangible ways (Merriam-Webster, n.d.)

[2] PFAS is the abbreviation for per-and polyfluoroalkyl substances

Research methodology and design

Research question

The research question is phrased as follows:

- What relevance and / or influence has Aaron Wildavsky's book *Searching for Safety* in today's safety discourse?

The purpose of the research is to assess the level of influence and relevance of the underpinning concepts of the key message of *Searching for Safety* actually has in the safety discourse. The concepts of resilience that are embedded in political science will be compared with the ones that have emerged in the 'new view concepts' in the safety discourse. Furthermore, the societal risk debates concerning nuclear power, pesticides, and the introduction of (new) drugs and medicines will be explored to understand Wildavsky's application of resilience therein and the relevance of Wildavsky's key message of *Searching for Safety* then and now.

Broader topic and relevance

Searching for Safety includes societal risk debates which are still present today: nuclear energy, vaccines and drugs, and pesticides (Wildavsky, 1988a, pp. 20, 23). A similar controversy is present today: PFAS.

Resilience in political science is a topic that appears to have evolved on its own without clear tangible links to the 'new view concepts' in the safety discourse, and especially RE. When assessing the library of the RE Institute for references, political science is absent (Resilience Library - Resilience Engineering Institute, 2018). This requires an understanding of the development of resilience in political science, and the role of political science in the safety discourse.

Searching for Safety, appears not to be well known in the safety discourse. This research study is therefore relevant to provide a momentum to place the author and the book in the limelight.

Research methodology

Considering the thesis topic, the author has to work within this world, including its objects, out of which he has to make meaning. The influence and relevance of *Searching for Safety* in the safety discourse is the thesis topic on where meaning has to be made. Taking into account that phenomena can be interpreted differently, both historically (in time) as cross-culturally (different scientific disciplines), hence being relativistic, the epistemology of the thesis topic is therefore drawn upon 'relativistic constructionism' (Crotty, 1998, p. 64).

The theoretical perspective is inspired by 'Interpretivism.' The latter refers to "the approaches which emphasise the meaningful nature of people's character and participation in both social and cultural life" (Chowdhurry, 2014, p. 2).

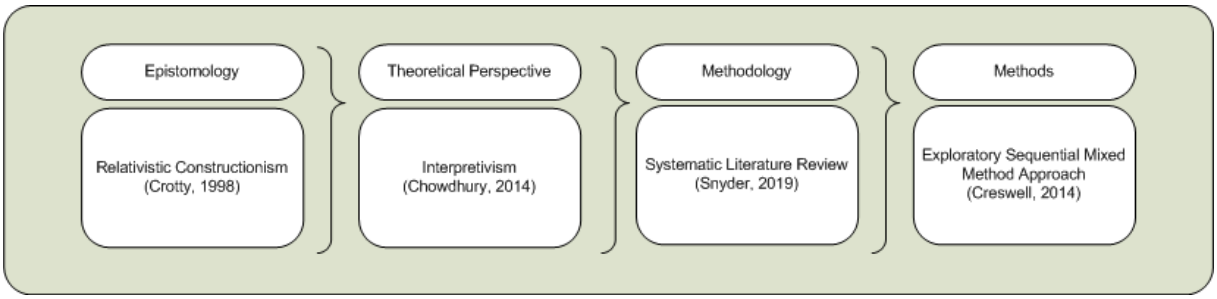
The proposed methodology which is drawn upon is 'Literature review.' A literature review "can broadly be described as a more or less systematic way of collecting and synthesizing previous research" (Snyder, 2019, p. 333). A 'Systematic Literature Review' will be undertaken, being "a research method and process for identifying and critically appraising relevant research, as well as for collecting and analysing data from said research, with the aim to identify all empirical evidence that fits the pre-specified inclusion criteria to answer a particular research question or hypothesis" (Snyder, 2019, p. 334).

'The Mixed Method Approach,' combines both qualitative and quantitative means of analysis (Seale et al., 2007 p. 283). First qualitative data collection and analysis will be applied, which builds up to a quantitative data collection and analysis, resulting in an interpretation of the combined results.

The complete research methodology is depicted in Figure 2 (Crotty, 1998, p. 2).

Figure 2

Research methodology

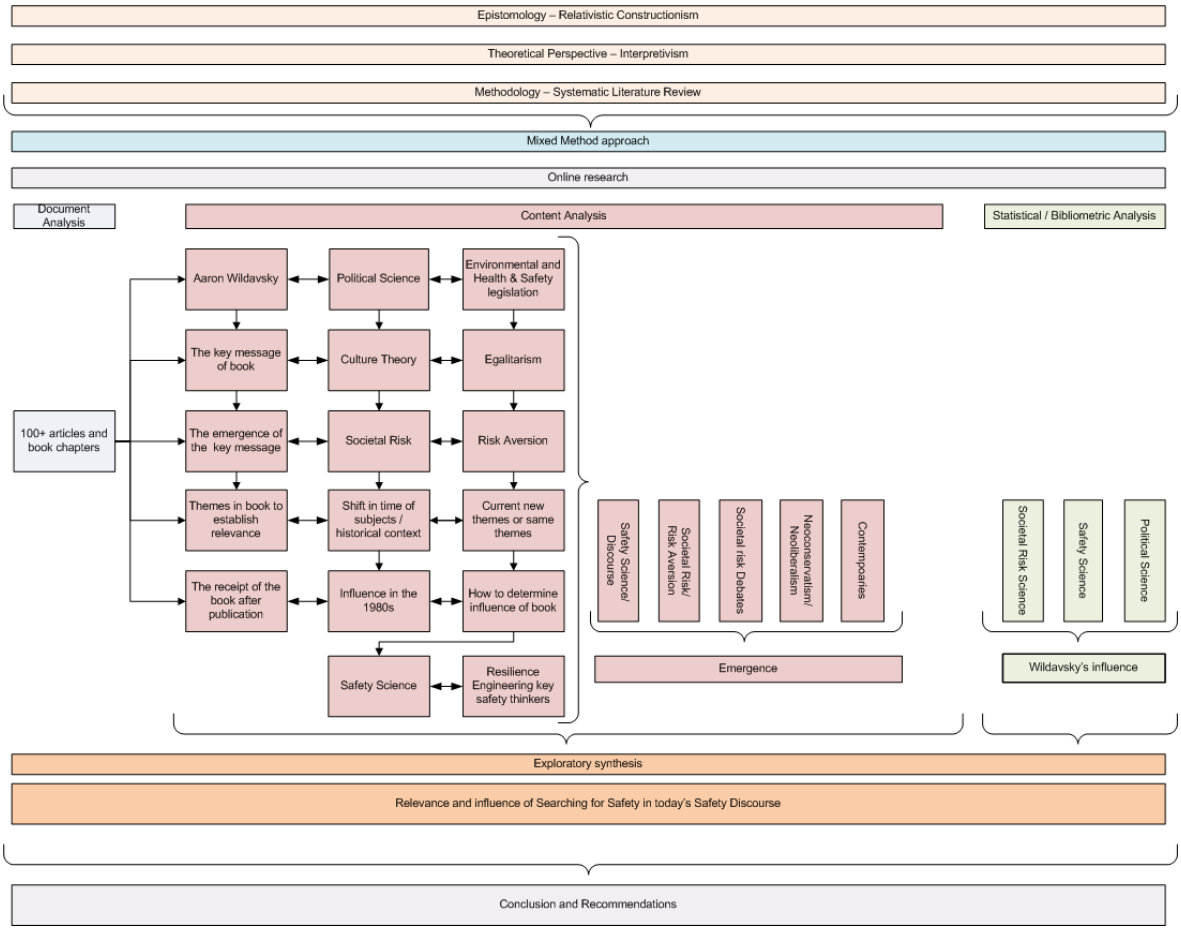


Research strategy

Based on the research methodology, the following research strategy has been applied as depicted in Figure 3.

Figure 3

Research strategy



The proposed qualitative and quantitative methods that will be drawn upon to perform the research will be inspired by the following methods:

- Online research,
- Document analysis,
- Content analysis,
- Statistical analysis,
- Bibliometric analysis.

Please note that a clear distinction in use is not possible since their underpinning techniques are similar or even intertwined as the following paragraphs will show.

Online research will be the overarching research method used. It is not just a single research method since it contains a myriad of social science research methods that have one thing in common: The research takes place by using the internet (Hooley et al., 2011, p. 3).

Desktop research will also be used to assess the books that are not available on the internet in hard copy. Desktop research will also include some of the following listed methods, namely document analysis, content analysis, statistical analysis and bibliometric analysis.

Document analysis is a systematic procedure for reviewing or evaluating printed and electronic documents. The latter being stored on a computer or accessible via internet (Bowen, 2009, pp. 29, 30). All listed articles and books in the reference list have been subject to document analysis to understand their added value and relevance.

The next step is to perform a further analysis on the contents of the relevant books and papers to make a first shift in topics. This analysis will be drawn upon content analysis. Content analysis is defined as "a family of research techniques for making systematic, credible, or valid and replicable inferences from texts and other forms of communication" (Drisko & Maschi, 2015, p. 7). Within content analysis there are three approaches: The basic-, the interpretive-, and the qualitative content analysis. (Drisko & Maschi, 2015, p. 1). All three types of content analysis have been used.

The basic method of content analysis has an overlap with one of the quantitative methods used in this thesis research: Statistical analysis. This is the science of learning from data (Ott & Longnecker, 2015,

p. 2). The basic content analysis and thus also statistical analysis will be used for 'simple statistics' (i.e., counts, averages).

A bibliometric analysis is defined as an analysis that "summarizes large quantities of bibliometric data to present the state of the intellectual structure and emerging trends of a research topic or field." It has three components: 1) Performance analysis, 2) Science mapping and 3) Enrichment techniques (Donthu et al., 2021, pp. 287-290).

The influence of *Searching for Safety* will mainly be measured in the first step with 'simple statistics and bibliometric analysis. The following types of analysis are considered:

- Performance analysis
    - Citation-related analysis.
        - The impact of the publication is determined by the number of citations (Donthu et al., 2021, p. 288). It will assess the total citations of *Searching for Safety*.

The results of the above-described methods will be the start of the second phase of the thesis research: a qualitative research synthesis. Major & Savin-Baden (2010, p. 10) call it an "approach that uses qualitative methods to analyse, synthesize and interpret the results from qualitative studies." This will be drawn upon and applied in the second step of this research to provide an answer to the hypothesis. Abductive reasoning will be the leading reasoning for the hypothesis validation of which the first step analyses results are used for. Abductive reasoning is applied to synthesize an explanation and hereafter verified by inductive reasoning. "Only the use of both processes together yields an acceptable explanation" (Paul, 1993, p. 111).

Expected findings and analysis of those findings

The main theme in Wildavsky's (1988a) *Searching for Safety,* is resilience and its underpinning concepts. These will be compared with the concepts of resilience as described by the 'new view' thinkers in the safety discourse which will be another important part to understand the relevance of the book today: (Hollnagel et al., 2006), (Woltjer et al., 2007). The bibliometric analysis will be used to determine the book's influence.

The three areas of interest discussed in *Searching for Safety* are: 1) The risks of the use of nuclear energy, 2) The risks of the use of pesticides, and 3) The introduction of new vaccines and drugs. These were scrutinized themes in the 1980s. The same areas of interest will be assessed on their status and relevance nowadays including PFAS.

The synthesis of the comparison of the aforementioned themes and the application of the underpinning concepts of resilience will be used to answer the posed research question.

Research ethics

The 'LU Research Practice' (Research Ethics and Animal Testing Ethics, n.d., 2023) applies for ethical research issues. It is concluded that this practice applies and will have no impact on the proposed research. To ensure that the research will be conducted in an ethical manner, the approval of the research proposal is considered to be a 'verification gate' as well (Blaxter et al., 2010, p. 167).

Previous research

No similar research has been found. Two books were found discussing Wildavsky and his works: An out-of-print book about Wildavsky containing a compilation of Wikipedia articles but with no references, and a Danish book about Wildavsky's political science heritage (Mortensen & Serritzlew, 2012).

Literature review

The literature review begins with information about the book and the author. Wildavsky was not so much a 'safety thinker', but a famous political scientist. His political ideals were founded in neo-conservatism. The various obituaries and profiles as found in the many non-safety science related journals[3] have been used for a deductive analysis to understand Wildavsky's background for a better appreciation of his argumentation in *Searching for Safety* (Wildavsky, 1988a; Goldman School of Public Policy, 2023; Chickering, 1993; Clarke & Ingram, 2010; Contemporarythinkers.org, 2015; Elazar, 1994; Horowitz, 2004; Jones, 1995; Smith, 2017; Polsby, 1985; Rose, 1994; Sharpe, 1993; Thoenig, 1993; Polsby, 1994; White, 1994a, 1994b).

To understand *Searching for Safety,* its key message and its reception, the book and its book reviews have been assessed as well as a symposium. The overlaps in critique have been summarised by means of an inductive content analysis on common themes: (Bradbury, 1989; Short, 1990; Gaskins, 1989; Bosso, 1989; Viscusi, 1990; Sills, 1988; Judkins, 1988; Jasper, 1989; O'Hare, 1989; Quinn, 1996; Rayner, 1990; Rothenberg, 1993; Dorfman, 1990; Katzman, 1988; Byrne & Martinez, 1989; Catton, 1989; Williamson, 1989). Wildavsky's response has also been included (Wildavsky, 1989b).

Political science has been explored to gain understanding of this science discipline as well as Wildavsky's achievements therein (Balla, et al., 2015; Goodin & Klingemann, 1998; Migone & Howlett, 2015; Jones & McCaffery, 1994; Wehner, 2015a, 2015b). For the understanding of neo-liberalism and neo-conservatism, the following literature has been reviewed: (Menand, 2023; Troy, 2009; Brown, 2006; High, 2009; Venogupal, 2015; Wolf, 2023; Gerstle, 2022). The similarities and differences of resilience in the two concepts have been explored, by making a comparison between the underpinning ideas of both concepts (Merigó et al., 2019; Bergström, 2020; Le Coze, 2022; Möller et al., 2018; Dekker, 2019).

[3] I.e., journals related to anthropology, political science, societal risk, to name but a few.

The emergence and highlights of the USA's EHS legislation was required to be understood, including Wildavsky's 'accusation of' overregulation (Boyd, 2012; Collins, 2006; Clarke, 1989; Montrie, 2018). Furthermore, a comparison has been made between the differences in EHS legislation between the USA and Europe during that time period (Vogel, 2012).

The underpinning cultural theory (CT) required understanding too. Therefore, the literature review also focusses on what CT entails and Wildavsky's role in it (Douglas & Wildavsky, 1982; Douglas, 2007; Thompson, Ellis & Wildavsky, 1990).

The safety discourse has been explored by describing the emergence and boundaries of safety science, and its influential thinkers / authors and Wildavsky's place therein (Le Coze, 2014, 2019a; Dwyer; 1992; Heinrich, 1941; Rae & Dekker, 2019; Aven, 2014; Hollnagel, 2014; Hale, 2014; Rae et al., 2020; Herrera, 2023; Sagan, 1993; Weick, 1999; Perrow, 1999; Hollnagel et al., 2006; Patriarca, 2018; Bergström & Dekker, 2014; Haavik et al., 2019).

Wildavsky (1988a) heavily criticized anticipation. To make sense of this, societal risk and risk perception has been looked into to understand Wildavsky's critique. Beck's (1992, 2009) and Adams' (1995) books have been assessed to gain understanding of societal risk and risk perception. Adams' book is pivotal herein: It explores the differences in Wildavsky's and Beck's view.

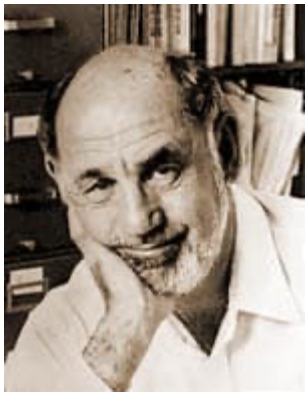
Findings and analysis – The author and the book

Aaron Bernard Wildavsky

Aaron Bernard Wildavsky (Figure 4) is considered as one of the most innovative and prolific scholars in the fields of political science, public policy, and public administration of our time (Jones, 1995, p. 3; Caiden, 1994, p. 6). This chapter provides an understanding of who Wildavsky was, his beliefs, and of his achievements.

Figure 4

Aaron Bernard Wildavsky (Goldman School of Public Policy, 2023)



Wildavsky was born on the 31st of May 1930 in New York city as third child and only son to live to adulthood of impoverished Jewish immigrants (Polsby, 1985, p. 736). He graduated from Brooklyn College in 1954 after doing military service in the US army for two years in the Korean war. After graduation, he went on a Fulbright scholarship[4] to the University of Sydney in Australia (1954-1955) where he published his first two articles and book at the age of 25 (Clarke & Ingham, 2010, p. 566). He

[4] With the support of the United States government and through binational partnerships with foreign governments, the Fulbright Scholarship Program sponsors US and foreign participants for exchanges in all areas of endeavour, including the sciences, business, academe, public service, government and the arts and continues to increase mutual understanding between the people of the United States and the people of other countries. The program is named after the US statesman J. William Fulbright (https://fulbrightscholars.org).

then returned to the USA where he became a graduate in the political science program at Yale University (Clarke & Ingham, 2010, p. 567; Goldman School of Public Policy, 2023; Contemporarythinkers.org, 2015).

Wildavsky received his doctorate in political science from Yale University in 1959. He started with Soviet politics (because of his parents, he spoke Russian), but switched to the study of American politics, and the field of public budgeting specifically. Word of mouth recommendations got Wildavsky to Oberlin College, where he took an assistant lectureship (Polsby, 1985, p. 739). Based on his success at Oberlin College, he joined the political science faculty at the University of California in Berkeley as a young associate professor in 1962 (Polsby, 1985, p.742). He remained for the rest of his life at Berkely University, except for two years as President of the Russell Sage Foundation in New York between 1977 and 1978 (Goldman School of Public Policy, 2023; Smith, 2017; Contemporarythinkers.org, 2015; Jones & McCaffery, 1994; Caiden, 1994; Polsby, 1985, p. 743).

At the age of 34, Wildavsky's fame as leading political scientist started with the publication of *The Politics of the Budgetary Process* (Rose, 1994, p. 67), which "conceptualized and legitimized a behavioural and political approach to the study of budgeting" (Caiden, 1994). With this book Wildavsky challenged received ideas by showing that the budgeting process was about politics rather than money (Rose, 1994, p. 67). This book established Wildavsky as "the single-most important scholar in the budgeting field" (Clarke & Ingham, 2010, p. 567). The book is recognised by the ASPA[5] as: "one of the most influential works of public administration in the last five decades" (Goldman School of Public Policy, 2023).

[5] American Society for Public Administration

The many books he wrote established his fame even further. Amongst other books, he is remembered for is *Implementation* (Pressman & Wildavsky, 1973). This book was co-written with graduate student Jeffrey Pressman. The practical moral of the book being: "There is no point in having good ideas if they cannot be carried out. Make the difficulties of implementation a part of the initial formulation of policy." The book initiated a plethora of implementation theories and studies worldwide (Rose, 1994, p.73; Pressman & Wildavsky, 1973, p. xix).

Wildavsky held various positions at Berkely: Chair of the Department of Political Science, founding Dean of the Graduate School of Public Policy, and President of the American Political Science Association (Goldman School of Public Policy, 2023; Smith, 2017; Contemporarythinkers.org, 2015; Jones & McCaffery, 1994; Caiden, 1994). The founding of the faculty of public policy was, as explained by Polsby (1985, p. 743), a success story for Berkeley mainly due to Wildavsky's managerial touch to build up the faculty from scratch.

There was much violence and fanaticism among students against the Vietnam war during his time at Berkely in the 1960s. This played a role in developing his antipathy toward extremism and the aims of radical egalitarianism (Contemporarythinkers.org, 2015). This antipathy resulted in the emergence of a neo-conservative view which is reflected in his works (Wildavsky, 1979b, 1991).

During his period as President at the Russel Sage Foundation[6] he met anthropologist Mary Douglas. Collaboratively they wrote *Risk and Culture*, hereby introducing cultural theory (CT), the follow-up on the group and grid theory of Douglas (Fardon, 1999, p. 166). CT has been a guidance to Wildavsky's further works (Wildavsky, 1986a, p. 239). The main argument of *Risk & Culture* was that "people choose what to fear to support their way of life." This book may be considered the genesis for *Searching for Safety* (Wildavsky, 1997, p. 5).

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[6] The Russel Sage Foundation is an organization that supports research into social, political and economic problems in the USA (Fardon, 1999 p. 144).

Being President of the Russell Sage Foundation was a short-lived experience because he was given his resignation after a conflict with the Chairman of the Board. The reason for this was vested in the limitations Wildavsky felt imposed on him (White, 1994b, p. 92).

Wildavsky collaboratively wrote three books about risk and EHS: *Risk & Culture*, *Searching for Safety*, and *But Is It True, A Citizen's Guide to Environmental Health and Safety Issues,* which was posthumous published in 1995. The aim of the latter book was "to let citizens make informed judgements on environmental and safety issues."[7] Wildavsky hoped to achieve that, when citizens were confronted with environmental & safety issues and claims of harm, would ask first: "But is it true?" (Wildavsky, 1997, p. 2). These books were considered, by his friends and for as being foe, being an assault on the prevailing policies in that time period (Jones, 1995, pp. 13, 14).

The parents of Wildavsky were Democrats. He switched over to the Republicans after their death. He believed that they were more in line with his own views towards individualism, libertarianism, human freedom, self-support and being openly patriotic. He had become disappointed in the Democratic party because of their infights and the loss of dominance of the right-winged Democrats view he favoured (Polsby, 1985, p. 737). As Sharpe (1993, p. 135) remarked: "Shooting down without mercy the large, comforting assumptions of the liberal left was perhaps Wildavsky's very favourite sport."

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[7] As Wildavsky explains: "The book is about citizenship in a scientific and technological age. It deals with the relationship between knowledge and action in major environmental and safety issues. That relationship involves charges that modern technology can harm human beings, other living creatures, and the natural environment. The evidence cited is based on scientific understandings which have been modified through political processes and have led to governmental actions. The charges and the counter charges by environmental and industrial groups, and the ensuing governmental decisions, are all bids for popular support. With that support government enforce major changes in industrial practices; without that support the environmental movement would collapse." (Wildavsky, 1997 p. 1).

His body of work shows a large amount and variety of topics.[8] He has written and co-authored about 40 books, and 168 articles and book chapters, some of which were awaiting publication when he passed away on the 4th of September 1993 (Jones & McCaffery, 1994). In a tribute, a listing was provided which clearly shows the importance of Wildavsky's achievements during his lifetime (Table 1) (Jones, 1995, p. 4).

Table 1

Achievements of Aaron Wildavsky

"Wildavsky received the first Charles E. Merriam Award from the American Political Science Association (1975) in recognition of career contributions applying theory to the practice of politics and government, the Paul F. Lazarsfeld Award for Research from the Evaluation Research Society (1981), and the Harold Lassweli Award from the Policy Studies Association for his contributions to the study of public policy (1984). In 1972, he received the American Society for Public Administration's William E. Mosher Award, and in 1982, ASPA selected him to receive the Dwight Waldo Award, honouring his contributions to the literature of public administration and his distinguished career as a scholar and educator. He was selected as Gaus Lecturer by ASPA in 1989 and received the National Distinguished Service Award from the American Association for Budget and Program Analysis in 1990. He was elected as Fellow of the National Academy for Public Administration in 1971 and the American Academy of Arts and Sciences in 1973. He was similarly honoured in 1983 by the Association for Public Policy Analysis and Management. Honorary doctorates from his alma maters, Brooklyn College (1977) and Yale (1993), were bestowed on Wildavsky, as was the Laurea ad Honorem degree from the University of Bologna, making him one of the few non- Italians ever so honoured. After Wildavsky's death in 1993, ASPA's Section on Budgeting and Financial Management established the Aaron B. Wildavsky Award for Lifetime Achievement in Public Budgeting."

[8] These topics cover budgeting and fiscal policy, political culture, community power and leadership, risk analysis and safety, environmental policy, and various United States presidency related topics, to name but a few.

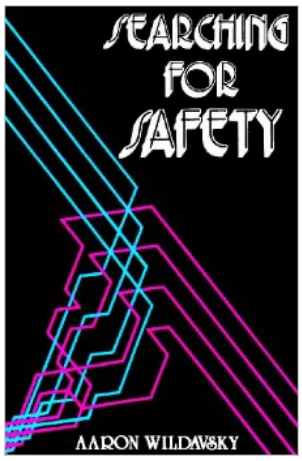
Searching for Safety – Key messages

Wildavsky tried to establish a policy-based strategy on objective risk (both observable dangers as well as the observable consequences of actions to increase safety), hereby excluding risk perception and politics (Wildavsky, 1988a, pp. 3,4). That this was not perceived as such by his contemporaries is discussed in the next chapter 'Searching for Safety – Critiques.'

Based on this objective risk, Wildavsky's (1988a, pp. 107, 221) key message of the book (Figure 5) is to seek safety by taking risk by incremental trial and error, thereby becoming resilient in favour of trial without error: To seek safety by avoiding risk, and thereby anticipating to ward off harm. Resilience is considered by Wildavsky in most cases to be superior to anticipation. The latter is only useful when one 1) Knows what to prevent, and 2) Knows how to prevent it, and 3) Is better off afterwards. This, as Wildavsky (1988a, p. 86) argues, is almost never the case since certainty is rare. The rationale behind this strategy of incremental trial and error is economics: A dollar can only be spent once, hence it is better to spent it in a decentralised manner as such in resources to deal with the unexpected, than to put the dollar in centralised anticipative measures towards a risk that does not materialise whilst another does which was not accounted for and cannot be dealt with since there are no means anymore.

Figure 5

Front cover Searching for Safety *(Wildavsky, 1988a)*



Wildavsky's concept of resilience is vested in 'The Principle of Irreducible Uncertainty,' 'The Axiom of Connectedness', and 'The Rule of Sacrifice.' The first, he argues, will always be present and that

(unforeseen) consequences cannot be reduced to zero since no one is omnipresent and aware of all consequences. With 'The Axiom of Connectedness,' he argues that "safety and harm are intertwined in the same acts and objects" as is graphically depicted on the book's front cover (Figure 5). Wildavsky combines these two principles because "uncertainty cannot be eliminated as damage cannot be avoided." He argues that the aforementioned combination can be applied to all known systems: "Each part of every system cannot be stable at the same time". He refers to economist Burton Klein to strengthen his argument (Wildavsky, 1988a, pp. 4-5).[9]

Wildavsky also introduces incrementalism as a means of resilience (Wildavsky, 1988a, p. 25). The incrementalism that Wildavsky prefers, is vested in the fact that errors are small but progressive and are learned from: 'Trial with small errors.' He borrows this from his own work on budgeting (Wildavsky, 1979b). He argues that large numbers of frequently adjusted small errors allow testing of new phenomena before they become too big to cause harm which is his concept of resilience (Wildavsky, 1988a, p. 27).

Wildavsky claims that "competition will increase income in wealth and subsequently people's well-being:[10]" By taking a safer society as the shared objective, he argues, one has to think about risk and

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[9] Klein questions whether predictability and stability go hand in hand. A predictable economic system can survive by the law of supply and demand, but to do this, it requires adaptation to deal with the new circumstances to remain stable. Klein explains that it must be 'dynamic[9]' He further distinguishes 'microstability' (individual) and 'macrostability' (large system). Hereby arguing that the greater the insistence to preserve an individual way of life, the lower the macrostability will be, and that both cannot be stable at the same time (Klein, 1980, pp. 1-3). Wildavsky calls this: 'The Rule of Sacrifice.' He argues that if individual members of a society are prevented from taking risk, the society as a whole is not able to adapt to new risks anymore. These principles are indebted to Holling and Hayek[9] and hark back to the complex system theory and neo-liberalism, as does the cited article of Klein (Klein, 1980; Wildavsky, 1988a, p. 6).

[10] "Market competition works to increase wealth so society can respond resiliently to dangers as they manifest themselves. Competition distributes the discovery process over the whole society (rather than concentrating in a few hands). By engaging many independent minds in the discovery process, competition speeds the rate of innovation-and the perception of incipient dangers that could result from innovation-while hazards are still small and localized. Competition fosters efficient use of resources, hence maximizing wealth and, indirectly, health. By increasing wealth, competition fosters resilience" (Wildavsky, 1988a, p. 75).

safety. Safety is a search process to find the right balance for a safer society. Risks and benefits are separately intertwined; thus, these should be balanced with the safety they can offer. A differentiator would be the consideration of the net benefit in risk assessments, for the reasons that one cannot test without any harm (risks and benefits intertwined), and society, acting through central government, cannot predict actions that will increase or decrease safety (Wildavsky, 1988a, p. 207). He is convinced that, because of these assumptions, actions are prevented that may have improved safety, and may have caused more harm instead (Wildavsky, 1988a, p. 208). Risk assessments should be used to ask what the total of expenditures to reduce risk (hence increasing safety) would be worth compared to the net benefits for human health or economic growth. He argues (1988a, p. 60) that increasing income for countries or classes of population increases their safety far more than all regulations to reduce risk.[11] Existing public policy is based on the belief that the way to reduce risk is to do so directly for each group of people adversely affected, as argued by Wildavsksy (1988a, p. 66). Such measures to increase safety may have three adverse effects on health: 1) They may directly cause harm through their design, 2) They may indirectly cause health to decay by decreasing household income, and 3) They may decrease the wealth of society in general, thereby weakening its resilience. These health reductions are next to the loss of opportunity benefits of the topic being banned. Based on a strategy of trial and error, the balance between opportunity cost and benefits should be searched for (Wildavsksy, 1988a, p. 38).[12]

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[11] It must be noted that this is a macro-economic statement meant for application over society, it would not be applicable to an undesired event in the workplace (Wildavksy, 1988a, p. 63).

[12] Opportunity costs are in economics based on scarcity. Because of that, choices have to be made. "Opportunity cost is the evaluation placed on the most highly valued of the rejected alternatives or opportunities. It is that value that is given up or sacrificed in order to secure the higher value that selection of the chosen object embodies." (Buchanan, 1991 p. 520). Based on the 'Axiom of Connectedness,' where safety and harm are intertwined, Wildavsky argues there are also opportunity benefits: opportunities to reduce existing harms that society forgoes when it is decided to delay or deny the introduction of a new substance or technology (Wildavsky, 1988a, p. 39). The dangers from risk taking and from risk aversion should be considered together, since if risks are taken away, benefits could be taken away as well (Wildavsky, 1988a p. 40). "Risk taking can thus improve safety, and that safety risks can be damaging. Society can benefit by taking risks as well as by not trying to prevent them.

The distribution of risk is interlinked with the above. Wildavsky argues that the whole is stronger than the parts thus individuals may be sacrificed to the benefit of society. As Wildavsky points out, there will always be the distributional question with both anticipation and resilience: who will gain and who will suffer? He argues that with resilience, society is better off, because of 1) Growth of wealth, 2) Enlarged knowledge and 3) Improved coping mechanisms to deal with the unknown (Wildavsky, 1988a, p. 102, 103). He argues that knowledge increases wealth, and wealth releases resources to gain further knowledge which provide more safety (Wildavsky, 1988a, p. 214).

Safety is thus considered by Wildavsky as "a process of discovery, since no objects or processes are wholly safe under all conditions, and since there is always room for improvement, it is crucial to discover better combinations"[13] (Wildavsky, 1988a, p. 227). He considers the search not comparable with evolution, since that does not guarantee optimization of a species (e.g., the power of the forces of natural selection: the fitter survives but is not necessarily the fittest). He states that "because there is no stable optimum, there is always room for improvement in safety through the generation and testing of new combinations" (Wildavsky, 1988a, p. 209).

Since safety is a process, it could also decline. Wildavsky argues that life could be fuller of risks or safety as it is:[14] constant effort is required to have no decline in safety, and to improve by using the advantages from unknown prospects of improvement. He reiterates that there are risks from new trials of products as well as opportunity benefits to be lost if one fails to reduce existing harms. Safety is relative as well. Wildavsky (1988a, p. 209) argues that "we are being safer than we used to, but that does not mean that in future, we are just as safe as now. New dangers may arise or existing dangers, not experienced yet, may be introduced." As Wildavksy (1988a, p. 93) highlights: "the growth of resilience depends upon

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If risk can increase safety, and if safety measures can increase risk, what criterion of choice can guide us through these apparent contradictions" (Wildavsky, 1988a, p. 54).

[13] Combining resources to make life better (Wildavsky, 1988a, p. 227)

[14] Wildavsky refers to safety as some level of well-being under certain conditions that cannot all be specified (Wildavksy, 1988a, p. 209).

learning how to deal with the unexpected." Thus, by decentralised incremental trial and error is meant: Learning from the large numbers of frequently adjusted small errors of new phenomena before they become too big to do harm (Wildavsky, 1988a, p. 27).

A summary of the key messages of the book are listed in Table 2.

Table 2

Overview of key messages

Key Messages
(Unforeseen) consequences cannot be reduced to zero since no one is omnipresent and aware of all consequences. Safety and harm are intertwined in the same acts and objects. Thus, uncertainty cannot be eliminated as damage cannot be avoided. Therefore, each part of every system cannot be stable at the same time.
Safety is a search process to find the right balance of risks and benefits for a safer society. Risks and benefits are separately intertwined: These should be balanced with the safety they can offer.
Safety is a process of discovery, since no objects or processes are wholly safe under all conditions, and since there is always room for improvement, it is crucial to discover better combinations.
Seek safety by taking risk by incremental trial and error, thereby becoming resilient in favour of trial without error: To seek safety by avoiding risk.
Resilience is to allow testing of new phenomena by large numbers of frequently adjusted small errors before they become too big to cause harm.
The growth of resilience depends upon learning how to deal with the unexpected.
Knowledge increases wealth, and wealth releases resources to gain further knowledge which provide more safety.
The whole is stronger than the parts thus individuals may be sacrificed to the benefit of society.
Increasing income for countries or classes of population increases their safety far more than all regulations to reduce risk.
Resilience is decentralised and anticipation centralised.
The economy of safety is the net benefit of opportunity costs and opportunity benefits

Searching for Safety - Critiques

The book was reviewed in various scientific journals. None of the journals found were related to the safety discourse. *Society*,[15] even included a symposium discussing the key message of the book (Figure 6). The symposium proceedings are discussed in Appendix E.

Figure 6

Cover of Society *(*Society*, 1989).*

A total of 15 book reviews about *Searching for Safety* have been found and reviewed (Table 3):

[15] To be precise: *Social Science and Modern Society*, *Volume 27*, Number 1 November/December 1989.

Table 3

Overview of Journals including book reviews of Searching for Safety

Name of Journal	Author	Year of publication
American Anthropologist	Rayner	1990
The American Political Science Review	Bosso	1989
Critical Review: A Journal of Politics and Society	Rothenberg	1993
International Journal of Mass Emergencies & Disasters	Bradbury	1989
Journal of Policy Analysis and Management	O'Hare	1989
Journal of Risk and Insurance	Dorfman	1990
Law & Society Review	Short	1990
American Scientist	Sherman	1989
Contemporary Sociology	Judkins	1988
Journal of Economic Literature	Viscusi	1990
Journal of Public Policy	Collard	1989
Cato Journal	Katzman	1988
Public Administration Review	Jasper	1990
Nature	Sills	1988
National Review	Williamson jr.	1989

The following structure is used to present the reviews:

- The book's reception
- Key message
- Critique on key message
- Omissions

- Conclusions

Per topic the most illustrative critiques are included. For the remaining critiques, reference is made to Appendix B.

The book's reception

The book was in general positively received by the various reviewers. It was considered a great case study in risk management (Dorfman, 1990, p. 564), an important book (Judkins, 1988, p. 663), an addition to the societal debate on risk (Bradbury, 1989, p. 202) and even a new and rival theory as to how achieve safety (Short, 1990, p. 181). Some of the reviewers considered the book being provocative (Jasper, 1990, p. 89; Katzman, 1988, p. 557), or even a polemic (Katzman, 1988, p. 557; Rayner, 1990, p. 808). Collard's critique provides a good example:

> "This is a dangerous book to give to policy makers since it mocks and scoffs so cleverly at restriction and regulation that it is liable to misunderstood. His book, hence, the title, is concerned with genuine uncertainty and poses the question of whether caution is ultimately the 'safest' approach; might there not be a species of Laffer-curve with respect to regulation and safety? Could too much caution be dangerous?" (Collard, 1989, p. 114).

Key messages

Although positive towards the book, the reviewers were not all entirely in agreement with the key messages of *Searching for Safety* considering the limited number of positive acknowledgements for its key messages against the number of critiques. Rothenberg's critique is in favour of the key message:

> "Wildavsky's argument is deliberately provocative, paradoxical, against-the-grain, and, while shaded to some extent, sufficiently sharp in profile to generate uncomfortable new questions as well as reformulations of more familiar ones. It forces a deep reconsideration of a host of ongoing issues, many of which are connected in this work for the first time. In other words, whether or not one agrees with much or even little in Wildavsky's book, it performs a very valuable function in prodding us to consider difficult concerns in novel connections (Rothenberg, 1993, p. 160).

Critique of key messages

The critiques on the book were based on Wildavksy's neo-conservative, cornucopian view. As identified in the previous chapter 'Seaching for Safety – Key messages,' Wildavsky's attempt to provide a policy based on objective risk was not entirely understood considering critiques to his own political view as well as missing the public's risk perception; The exclusion of subjective risk. The following critiques set a good example:

> "But many of the obstacles to innovations of the sort which he seems to favour (e.g., nuclear power) are, as he indicates, political. If Wildavsky's plea for use of cost-benefit analysis is to be accepted, one would think that subjective values should be part of the equation" (Jasper, 1990, p. 89).

> "Wildavsky's sympathies are with the right, as he freely admits, and he aligns himself with the 'cornucopian's' rather than the 'catastrophists.' The extent to which his ideology colours his analysis is a question I think each reader must answer individually" (Sills, 1988, p. 303).

> "Wildavsky is very much open to the line of criticism that he takes too neo-classical a view of competition, ignoring large scale effects and externalities. Is it acceptable that owners of oil tankers should 'search for safety' by trial and error?" (Collard, 1989, p. 115)

Wildavsky's view is further explored in the chapters 'Society and risk perception,' and 'Neo-conservatism and neo-liberalism.'

Omissions

Further critiques are provided based on the by the reviewers considered omissions:

- the lack of empirical evidence or incomplete evidence for Wildavsky's argumentation.
- the omission of probability in Wildavsky's risk definition
- the distribution of risk where Wildavsky is accused of to have taken this too light hearty.

The following critiques highlight these topics:

> "A notable feature of the risk literature is a lack of agreement on the basic concepts. No less than 13 definitions of risk were proposed for consideration by the society of risk analysis. However,

none were restricted solely to observable effects. All included an element of probability which leads to discussion of uncertainty and the role of the scientist's judgement in producing risk estimates, rather than facts. Wildavsky's omission of this element results in missing what, in my opinion are the fundamental issues raised by the risk debate" (Bradbury, 1989, p. 203).

"There is, however, no attempt to demonstrate or prove either principles or derivative propositions by rigorous logic or conclusive empirical analysis" (Rothenberg, 1993, p. 162).

"Perhaps the most important omission is serious consideration of distributional equity issues, which Wildavsky acknowledges in his introduction. However, the book carries a strong polemical message: constituencies in society who seek to manage uncertainty differently from the path that promotes the highest over- all level of physical health should not distract us from rational management of objective risk. The existence of different visions of fairness and of the good life are given cursory acknowledgment" (Rayner, 1990, p. 808).

Conclusions

The reviewer's conclusions are mixed. On one hand, they praise the book: 'Provocative' as well as 'important' are terms used by various reviewers (Dorfman, 1990, p. 565; Jasper, 1990, p. 90; Sherman, 1989, p. 182; Short, 1990, p. 187). On the other hand, they disagree with parts of the argumentation of the key message and subsequent lack of empirical basis for Wildavsky's arguments (Rayner, 1990, p. 808; Collard, 1989, p. 559). In addition, the acceptability of the key message by the general public is questioned (Sherman, 1989, p. 182; Katzman, 1988, p. 559 Considering all conclusions, a positive reception of the book comes to surface (Table 4). Rothenberg's critique provides a good reflection:

"*Searching for Safety* is an important book. Many of our judgments and actions about health and safety risks are the result of habit, or incrementalism, or the hot sense of urgency, or the inability even to attempt to make a coherent, consistent whole of vastly disparate commitments. Wildavsky has issued a ringing, impassioned challenge to the field, and has raised many penetrating questions about established ways of thinking about risk and preparing for it. That there are difficulties with several of his arguments is less important than that they force us to rethink and recommit ourselves. It is clear that there are no easy answers here. There are not even easy questions. We should be deeply

indebted to Wildavsky for forcing us to search for difficult answers by asking tough questions" (Rothenberg, 1993, p. 180).

Table 4

Main conclusions

Main Conclusions	
Positive	Critique
The book is provocative, well written, timely and will be a lively and stimulating reading	The book does not provide an adequate strategy when the damage done by individual agents (companies) is large in relation to the system as a whole.
The book makes an important contribution to enriching the quality of decisions about safety	The book will provide no reassurance to the current public perception of risk or alter it.
By conceptualizing the debate in terms of risk taking versus risk aversion, Wildavsky provides a framework for both further theoretical and empirical work.	The book lacks empirical evidence or incomplete evidence for the used argumentation.
Searching for Safety is an important book. It has raised many penetrating questions about established ways of thinking about risk and preparing for it.	The omission of probability in Wildavsky's risk definition
	Wildavsky is accused of to have taken risk distribution too light hearty.

The following chapters will provide context to the book and the raised critiques.

Findings and analysis – The context

Political science and resilience

Political science is considered to be a discipline within social science (Goodin, 2011, p. 12). It is a collection of various subdisciplines instead of one overarching discipline. 'Politics' may be considered as the constrained use of social power[16]. Political science is the study of politics: The study of the nature and source of those constraints and the techniques for the use of social power[17] within those constraints (Goodin & Klingemann, 1996, p. 7). This chapter explores political science, Wildavsky's place in it, as well as the emergence of resilience therein and compares this with RE in the safety discourse.

The following sub-disciplines are distinguished (Goodin, 2011, p.16) (Table 5):

Table 5

Political Science sub-disciplines

Sub-discipline	Scope
Law and politics	To determine what is law, to identify the common features of a legal system, and to clarify the logical structure of law (Whittington et al., 2008, p. 8)
Political economy	To explore the relationship between individuals and society and between markets and the state, using methods drawn from economics, political science, and sociology (Political Economy | Definition, History, Types, Examples, & Facts Definition | Britannica Money, n.d.)

[16] With constrained power is meant that political power is used and not brute military force (Goodin & Klingemann, 1996, p. 7)

[17] "Dahl's (1957) old neo-Weberian definition still serves well enough to describe 'power.' In those terms, X has power over Y insofar as: (i) X is able, in one way or another, to get Y to do something (ii) that is more to X's liking, and (iii) which Y would not otherwise have done" (Goodin & Klingemann, 1996, p. 7)

Sub-discipline	Scope
Political methodology	To study existing statistical techniques and develop new ways to use statistics to estimate and identify political effects and make sense of political data (Political Methodology | Political Science, n.d.).
Political behaviour	To analyse the political behaviour based on the assumption that politics as a special form of human activity is not, and cannot be, independent of what is known or knowable about social behaviour in general (Political behaviour |Encyclopedia.com, n.d.).
Compliance policy	The study of regulation as a political construct (Short, 2019, p. 1)
Political context	To analyse how the dynamic effects of the social environment shapes the way the citizen views politics (MacKeun & Brown, 1987, p. 471).
Public policy	To identify objective and scientific solutions for clearly defined policy problems (Knoepfel et al., 2011).
International relations	The study of international relations is divided into the following: international security (the study of war, conflict, peace, etc.,), international political economy (trade, foreign direct investment, international finance, etc.), and also other areas of global concern, including the environment, human rights, and international law (International Relations | Political Science, n.d.).
Political theory	The study of justice, legitimacy, and power by conjoining normative theory (reflection on political values), positive theory (study of how values can be achieved by institutions), and the intellectual history of political thought (Political Theory | Political Science, n.d.).

Wildavsky specially made his fame as a political scientist in 'public policy'. His books about *The Politics of Budgeting* and *Speaking Truth to Power* still have an impact in this discipline (Goodin, 2011, pp. 34-35).

Goodin (2011, p. 3) distinguishes three types of political scientists: 1) The counsellor types, advising on how to seize and wield power; 2) The critics, adopting a critical stance towards the powers that be, and 3) Self-styled political scientists, ranging in style from accommodative towards critical. Wildavsky is considered to be one of the third type.

The history of political science can be explained by means of a curve in scientific progress. The curve starts off with Plato in the Old Greece, where it further rises during the Roman times, doing not much during the Middle Ages, make some progress again with the Renaissance and the Enlightenment, and from the 19th century onwards rising strongly, and even more in the 20th century including three small peaks. These peaks are related to the interbellum between the two world wars, the introduction of behavioural political science, further professionalization of the discipline, and last but not least, the introduction of mathematical / economic models to cater for the rational choice approach (Almond, 1996 p. 50). The thesis focus will be mainly on the period after WW II.

Due to the many societal changes in the 1960s in Europe and the USA, a new view of political science was developed during this time. The system concept was introduced: New interdisciplinary fields emerged such as organization theory, but also public policy research. Together with the discipline of political economy this was jointly pioneered in Europe and the USA. Wildavsky excelled in both disciplines (Goodin, 2011, p. 3).

Resilience

The study of resilience initially emerged in mechanical engineering (i.e., stress-strain model) and later in economics, health, psychology, and ecology (Walker & Cooper, 2011, p. 5; Bergström, et al., 2015, p. 132). The article by Holling (1973) dealing with 'Resilience and stability of Ecological Systems' is considered the genesis of the adoption of the term resilience (Andersen, 2015, p. 62; Walker & Cooper, 2011, p. 144; Norris, et al., 2007, p. 127). It was a reaction to the stability concept in ecology by arguing that "ecosystems do not evolve towards a single stable climax state but undergo periodic cycles of change" (Martin-Breen & Anderies, 2011, pp. 36-37). Holling identified two types of resilience: 'Engineering

Resilience'[18] and 'Ecological Resilience.' [19] He envisaged a management approach based on the latter. He argued that "such a resilience framework must absorb and accommodate future events in whatever unexpected form they will appear." In later work he would further explore this, and as a result, the Resilience Alliance was established focusing on social-ecological resilience, hereby introducing the 'Panarchy.' [20] The Resilience Alliance became the think-tank 'the Stockholm Resilience Centre' (Walker & Cooper, 2011, p.147).

Resilience as a concept was thus earlier used in political science in public policy themes like societal risk, economics, ecology, and crisis management from the 1970s onwards, before it got traction in the safety discourse in the early years of this century.

It has evolved in three frameworks that vary in complexity. The simplest framework is 'Engineering Resilience,' [21] thereafter comes the 'System Engineering,' [22] and last but not least, 'Resilience

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[18] With 'Engineering Resilience' he referred to stability or "the ability of a system to return to an equilibrium state after a temporary disturbance" (Holling, 1973, p. 17).

[19] He defined 'Ecological Resilience' as "a measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables" (Holling, 1973 p. 14).

[20] An integral theory integrating society, economy and the biosphere (Walker & Cooper, 2011, p.147).

[21] The 'Engineering Resilience' framework is about the ability of enduring stress, and the quickness of recuperation. Stress can mean either persistent difficulty or instant crisis (Martin-Breen & Anderies, 2011, p. 5). It may apply to engineered structures or even persons. A limiting factor with this framework is 'returning to normal.' Trying to keep it in the same condition may increase the chance of a future adverse event (Martin-Breen & Anderies, 2011, p. 5).

[22] The 'System Resilience' framework takes maintaining the system function(s) in the event of a disturbance into account. These function(s) may be related to the topics that humans need to survive (e.g., food, drink, shelter, medical care) in case of crisis management (Martin-Breen & Anderies, 2011, p. 7).

in a Complex Adaptive System.'[23] Hollings' proposed ecological resilience framework was a first attempt to describe the latter (Martin-Breen & Anderies, 2011, p. 5; Walker & Cooper, 2011, p. 147).

The study of resilience is also intertwined with neo-liberalism, since Hayek's theory of 'Spontaneous Order' is a further continuation of his criticisms of socialist planning in the market economy to a theory of the economy as a complex system: Complex system theory (Vaughn, 1999, pp. 245 – 246, 250; Walker & Cooper, 2011, p. 148). It is argued that Holling was inspired by Hayek's work (Walker & Cooper, 2011, p. 147)

But what about system boundaries? A system can be on a micro-level (person or organization), meso-level (group of persons, group of organizations), and macro-level (a nation, entire eco system) (Martin-Breen & Anderies, 2011). Bergström & Dekker (2014) provide a narrower view of system boundary classification, which as explained by them is represented by the individual representing the micro-level, whereas the meso-level is represented by an organization and macro by society. For this thesis, the broader view of Martin-Breen & Anderies applies since it allows for covering global matters.

Complex System Theory[24] may be the linking pin to the RE discipline in the safety discourse (Bergström, 2017, p. 33). Whereas resilience as a concept was earlier already embedded in political science rather than the safety discourse, the RE principles are based on the same complex systems theory only

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[23] The difference between 'System Resilience' and 'Complex Adaptive Systems Resilience' is vested in 'Adaptability,' which is "the ability to withstand, recover from, and reorganize in response to crises" (Martin-Breen & Anderies, 2011, p. 7). The function is maintained but that cannot be said about the system structure. This framework is based on the complex system theory, a theory based on the neo-liberal Austrian school of thought as promoted by Hayek (Vaughn, 1999, p. 250).

[24] "A Complex System is a group or organization which is made up of many interacting parts. Archetypal complex systems include the global climate, economies, ant colonies, and immune systems. In such systems the individual parts—called 'components' or 'agents'— and the interactions between them often lead to large-scale behaviours which are not easily predicted from a knowledge only of the behaviour of the individual agents. Such collective effects are called "emergent" behaviours. Examples of emergent behaviours include short and long-term climate changes, price fluctuations in markets, foraging and building by ants, and the ability of immune systems to distinguish 'self' from 'other' and to protect the former and eradicate the latter" (Mitchell & Newman, 2002).

with another perspective and system scale in mind (main focus on micro rather than macro) but fits nicely in the 'Complex Adaptive Systems Resilience' framework as the definition of RE shows. [25]

Wildavsky's resilience fits in this framework as well (Table 6).

Table 6

Comparison between Wildavsky's and RE resilience

Characteristics	Wildavsky's Resilience (1988a)	RE Resilience (Le Coze, 2022)		
System level	Macro	Micro	Micro	Micro / Macro
Resilience Framework	Complex Adaptive Systems Resilience	Complex Adaptive Systems Resilience		
Foundation	Complex Systems Theory	Complex Systems Theory		
Principle	*Policy*	*View*	*Methodology*	*Theory*
	Searching for Safety (Wildavsky, 1988a)	Safety Differently (Dekker, 2014)	Safety II (Hollnagel, 2014)	Theory of Graceful Extensibility (Woods, 2018)
Characteristics	Learning from phenomena by small progressive incremental trial by error before it can harm based on variety and redundancy	People are risk competent based on relationships of trust & honesty, their operational	The ability to succeed under varying conditions, so that the number of intended and acceptable	Explanation of the contrast between successful and unsuccessful cases of sustained

[25] "RE is a trans-disciplinary perspective that focuses on developing theories and practices that enable the continuity of operations and societal activities to deliver essential services in the face of ever-growing dynamics and uncertainty. It addresses complexity, non-linearity, inter-dependencies, emergence, formal and informal social structures, threats and opportunities" (Resilience Engineering Association, 2023).

Characteristics	Wildavsky's Resilience (1988a)	RE Resilience (Le Coze, 2022)		
		expertise and learning	outcomes is as high as possible	adaptability[26] for systems that serve human purposes
Hierarchy	Decentralised	Decentralised	Decentralised	Centralised /Decentralised
Application	Society	Dynamic Systems / Sociotechnical Systems	Dynamic Systems / Sociotechnical Systems	Dynamic Systems / Sociotechnical Systems / Systems that serve human purposes

It is concluded that despite common ground, resilience is a term that has a different meaning related to the purpose it is used for. Resilience as used in RE mainly focusses on adaptability of the individual worker or organisation towards changing conditions. One may argue that Wood's Theory of Graceful Extensibility is usable in both the micro and the macro level. The latter being the level where Wildavsky's resilience is vested.

The emergence of public Environmental and Health & Safety legislation in the USA and EU

This chapter examines the emergence of the Environment and Health & Safety (EHS) legislation in the USA and EU and which Wildavsky critiqued.

[26] Sustained adaptability refers to the ability to continue to adapt to changing environments, stakeholders, demands, contexts, and constraints (in effect, to adapt how the system in question adapts) (Woods, 2018, p. 433).

The emergence of EHS legislation in the USA began with the industrial revolution in the early nineteenth century (Montrie, 2018, p.10). One of the first topics being addressed was clean drinking water: The industries dumped large quantities of contaminated waste water directly into local streams and rivers, already contaminated by raw sewage from households of the industry workers. These sources of drinking water thus became smelly open sewers resulting in recurring deadly diseases (Montrie, 2018, p. 28). State boards of health were organized, advocating for laws to control the pollution. This led to new legislation about sanitation, public hygiene, and provided the foundation of population-based risk thinking to all environmental hazards (Boyd, 2012, p. 913).

After WW II, various new technological advances were introduced. The use of these had unintended consequences to the environment and the public. Examples are nuclear testing, the introduction and use of many synthesized chemicals (e.g., pesticides), the increased use of automobiles, and the introduction of plastics, to name but a few (Montrie, 2018, p. 12).

The regular atmospheric and underground nuclear tests from the 1950s onwards[27] had an adverse effect on the environment and public health.[28] The introduction of chemicals[29] was another problem to be dealt with by the government. It turned out that it was 'easier' to set permissible limits exposure for radiation, than to set safe levels of chemical exposure in the workplace. Challenges were in low-level exposures, long latency periods and chronic poisonings. Limits were urgently required, since relation between exposure with chemicals and occupational cancer were clearly identified and resulted in public demands for stringent legislation (Boyd, 2012, pp. 923, 929).

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[27] For instance, at the Nevada Test Site, located 65 miles northwest of Las Vegas, there have been 100 atmospheric tests and 828 underground tests conducted until 1992). (Nevada National Security Site, n.d.).

[28] These have resulted in many cases of leukaemia and further emerged in extraordinarily high rates of cancer and thyroid illnesses towards the residents of the nuclear fall-out downwind villages. It also resulted in substantial quantities of radioactive waste (Solomon, 2019).

[29] About 25,000 registered in 1947 alone, and increasing in numbers ever since (Boyd, 2012, pp. 923, 929)

The outcome of these unintended consequences, resulted in the now famous book by Rachel Carson, called *Silent Spring* (Montrie, 2018, p. 6; Boyd, 2012, pp. 915, 939; Carson, 2000). This book, like Ralph Nader's 1965 book *Unsafe at any speed: the designed-in dangers of the American automobile*,[30] was at the right place, and at the right time. Both books are considered to be catalysts in both public EHS awareness and influence towards development of the first wave of EHS legislation in the USA in the 1960s and '70s. This legislation included explicit mandates to protect the public with an adequate margin of safety (Boyd, 2012, p. 915). The approach taken was based on the precautionary principle.[31] Wildavsky opposes the latter by arguing that it is a marvellous piece of rhetoric.[32] A good example of this principle is the 1958 Delaney clause:[33] All substances were treated as equally hazardous (Jasanoff, 1986, p. 35). All chemicals used in food had to be tested for their safety. As an answer to the clause, the 100-fold margin of safety was developed.[34] This safety factor was included in the legislation and was widely used from that moment on (Boyd, 2012, p. 933).

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[30] Nader's book dealt with the unsafe design of cars (with the main example being the Corvair of General Motors). The unsafe car design was considered one of the main causes for the high number of automobile related deadly accidents in the USA (Nader, 1965; Brumagen, 2013).

[31] The precautionary principle is an approach in policy making that legitimizes the adoption of preventative measures to address potential risks to the public or environment associated with certain activities or policies (Epstein, 2016).

[32] "The precautionary principle is a marvellous piece of rhetoric. It places the speaker on the side of the citizen—I am acting for your health—and portrays the opponents of the contemplated ban or regulation as indifferent or hostile to the public's health. The rhetoric works in part because it assumes what actually should be proved, namely that the health effects of the regulation will be superior to the alternative. This comparison is made possible in the only possible way—by assuming that there are no health detriments from the proposed regulation" (Wildavsky & Wildavsky, 2018).

[33] The Delaney Clause established a "zero tolerance for chemicals added to the food supply in any quantity if there were evidence that such chemicals induced cancer in animals or humans" (Boyd, 2012, pp. 901, 931)

[34] It was based on the fact that chemicals in food should have a 100-fold margin of safety in extrapolating the outcome from animal tests. This was based on the rule of thumb rationale that human beings were 10 times as sensitive to poison than a

Maximum Allowable Concentrations (MAC), and its predecessor Threshold Limit Values (TLV), were the first attempts, based on concentration limits, as a level of control for chemicals. (Boyd, 2012, p. 925). It became a set of uniform limits for the aforementioned MAC and TLV, to identify the demarcation between safe and unsafe (Boyd, 2012, pp. 926; 927). Despite its limitations,[35] TLV's became an important innovation in occupational health and safety (legislation) (Boyd, 2012, p. 927).

The use of 'acceptable risk,' as the redefined definition of safety, came into fashion in the 1970's as formal quantitative risk assessment methods emerged as the basis for EHS legislation. These steps were taken to make sense of the increasingly complicated world of environmental hazards when introducing new analytical and detection methods. (Boyd, 2012, pp. 964; 965). Because of these new methods, previously believed safe doses were suddenly not considered safe anymore and were prohibited because of the aforementioned Delaney Clause. It became evident that a literal interpretation of this clause was unattainable (the so called 'no molecule theory'). The 'no molecule theory' was also criticised by Wildavsky. He opposes this to point out the fact that virtually everything the human species do is linked with carcinogens, thus he concludes, "to ban carcinogenic substances, is to ban life since poisons are an integral part of nature (e.g., chemical warfare among plants, animals and insects)" (Wildavsky, 1988a, p. 25).

The dose-response model for exploration was introduced and defined as acceptable level of risk as 1 in 100 million (Boyd, 2012, p. 966). Together with the emergence of system thinking (i.e., the use of management systems, protocols, and frameworks), to rationalize agency decision making, hereby removing the elements of individual judgement (the expert judgement), this way of environmental risks determination got traction (Boyd, 2012, p. 977). The dose-response threshold was criticised as well by

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rat, and that a sick person may be as much as 10 times more susceptible to toxic substances, than a person in good health. Multiplying this results in a safety factor of 100 (Boyd, 2012, p. 933).

[35] Like the oversimplification by not taking the inherent variability among humans into account as well as the laboratory research and difficulties in extrapolation from animal toxicity tests results to human exposure limits (Boyd, 2012, p. 927).

Wildavsky. He questioned the soundness of the animal tests used to determine these thresholds (Wildavsky, 1996).[36]

'Acceptable risk' changed to 'unreasonable risk.' Whereas the first focuses on the hazards to the public, the latter suggests that it should only be allowed to regulate the underlying activity if the associated risks were deemed to be unacceptable: A cost / benefit analysis to determine the environmental risk. Industry lobbying efforts intensified as part of these environmental politics (Boyd, 2012, p. 977). This industry lobbying is further discussed in the chapter 'Society and Risk Aversion.'

The 1970s and the first half of the '80s was also the time that Wildavsky published his articles that would become *Searching for Safety*. (Wildavsky, 1979a, 1979b, 1981, 1985, 1987, 1988a, 1988b).

Quantitative Risk Assessment (QRA) became the new approach from the 1980s onwards. The 'Benzene decision' by the Supreme Court of the USA in 1980 is considered to be its start.[37] As Boyd (2012, p. 980) points out: "Safety could no longer be defined as risk free."

At the end of the 1980s, regulatory reform took place and the existing EHS regulation in the USA was no longer in favour due to change in political view and the changes in society. Instead, the focus was on regulatory reform, resulting in the use of 'calculable risk,' instead of the before used incalculable uncertainty. 'Calculable risk' was considered the future of EHS law. The change in political view is further explored in chapter 'Neo-conservatism and neo-liberalism.'

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[36] "There is no doubt that models based on research with animals have increased our understanding of metastasis, which is so important in the spread of cancer…None of the many invaluable uses of animal cancer tests, however, tells us whether they can come close enough often enough to be a valid source of evidence in predicting human cancer" (Wildavksy, 1996, p. 29).

[37] The court rejected OSHA's proposed Benzene Standard, which was based on precaution, in favour of a quantitative approach to identify the 'significant risk.' This was also the beginning of the end for the Delaney Clause. It became clear that "in many areas risk cannot be eliminated completely without unacceptable social and economic consequences" (Boyd, 2012, p. 971).

From the 1990s onwards the precautionary principle therefore disappeared in USA's EHS legislation but appeared in the European Union (EU) one. Since then, this EU legislation is on average more stringent than its USA counterpart, despite the fact that the emergence of the EU legislation (first in the separate countries, later combined in the EU), followed an almost similar track as the emergence of the USA legislation (with some EU countries even adopting the latter in their National legislation (Vogel, 2012, p. 3).

The reasons for this change in policy making appears to be related to the shift in the USA to QRA, the cost-benefit analyses, a scientific-based approach, and the regulatory reform focusing on the decreasing of 'over-regulation.' Furthermore, the increasing American polarizing partisan politics resulted in a regulatory vacuum. The EU have adopted the precautionary principle, and hereby focusing on 'under-regulation:' making existing less stringent legislation more stringent. Because of the size of the EU domestic market (now larger than the USA), many non-EU countries have had to adopt EU legislation to be able to sell products in the EU. The EU legislation has therefore become the 'global standard' (Vogel, 2018, pp. 16, 17, 228). Another reason is that many influential EU politicians and decision makers come from 'green' states: Countries that had a more stringent legislation towards environmental health and safety hazards before they joined the EU (Vogel, 2018, p. 243).

As already identified, the effects of nuclear testing, and the use of new synthetic chemicals, resulted in a strong public outcry in the USA for legislation to control these hazards. Especially in the 1960s and '70s there was a strong public demand because of the many environmental issues that were experienced in the USA (e.g., Love Canal,[38] TMI,[39] and air pollution in the cities). Love Canal was also used by Wildavsky as one of the examples to determine factual risks. He argued that the related studies were not sound, and that media attention and politics played a considerable role into the hysteria and

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[38] Love Canal became a dumping ground for nearly 22,000 tons of chemical waste (including polychlorinated biphenyls, dioxin, and pesticides) produced by the Hooker Chemicals and Plastics Corporation in the 1940s and '50s (The Editors of Encyclopaedia Britannica, 2023; Mpetruzzello, 2020).

39 Three Miles Island.

subsequent costly actions for clean-up (Wildavsky, 1997, pp. 126 – 152). This is further explored in the chapters 'Risk Perception' and 'Discussion.'

The public demand has now changed: Since the 1990s the American public broadly favours the current status-quo of not to weaken the existing regulation but also not to strengthen it. (Vogel, 2018, p. 230). The EU citizen however, increased its demand for more stringent regulations from the 1980s onwards, as a result of Chernobyl, toxins in the river Rhine, AIDS contaminated blood in France (which adversely affected thousands of patients), and mad cow disease (BSE), to name but a few. After the fall of the Berlin Wall and the subsequent ending of the Cold War, more time and effort had been put in the development of legislation by the EU to meet this increased public demand (Vogel, 2018, p. 237).

QRA and Cost Benefit analysis used to determine 'acceptable risk' appears to be executed in an objective rational, nonarbitrary manner (Jasanoff, 1986, p. 28), however the outcomes of these assessments are actually biased, hence subjective, because these risk assessments can be interpreted differently or based on different data, assumptions, questions, or values, and scientists themselves may not always agree (Vogel, 2018, p. 17). It also has a political perspective: "acceptable to whom?" (Jasanoff, 1986, p. 28). In the face of scientific uncertainty and public pressures, policy makers may choose a different approach to the level of risk acceptability (Vogel, 2018, p. 17). As Douglas and Wildavsky (1982, p. 194) observe, "Acceptable risk is a matter of judgment and nowadays judgments differ."

Jasanoff (1986, p. 79), identifies that cultural factors also play an important role, "since these influence goals and priorities in risk management." She further indicates that different societies respond differently to the same risk (e.g., the risk of the use of non-pasteurized milk in food; accepted in Europe, a no-go in the USA since 1949) (Vogel. 2018, p. 5). Douglas and Wildavsky point out that "questions about acceptable levels of risk can never be answered just by explaining how nature and technology interact. What needs to be explained is how people agree to ignore most of the potential dangers that surround them and interact so as to concentrate only on selected aspects" (Douglas & Wildavsky, 1982, p. 9) In this case, the selected aspects are the environmental health and safety risks that now get more attention than other, perhaps even 'riskier,' risks for the public. To determine this, they used CT.

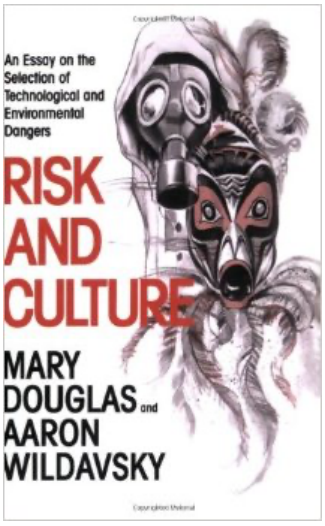
Cultural theory

Cultural theory (CT) is a further evolution of the grid-group theory developed by Mary Douglas in 1970 (Douglas, 2007) (Appendix D). Her grid-group theory was a life changer for Wildavsky. It provided him a means to understand the change in response to the use of nuclear energy: where in the 1940s and '50s, the public was in favour, the 1960s and '70s saw the opposite: The public was in anger and revolted against it, they were against the use of nuclear energy because of the environmental impact and its intrinsic dangers. Therefore, Douglas and Wildavsky (1982, p. 186) wanted to understand the social forces that represent the environmental protection in America (Figure 7). This chapter explains CT and the understanding of Wildavsky's meaning of subjective risk (Wildavksy, 1988a, p. 3).

Wildavsky put a lot of effort in the development of CT during the 1980s and early '90s. CT provided for Wildavsky a universal theory that he used as a starting point for his various contributions to a wide variety of subjects. Wildavsky became convinced that the anthropological approach of CT had the potential to change social sciences in various ways, of which risk thinking was one of them (Lockhart & Coughlin, 1998, p. ix).

Figure 7

Front cover of Risk & Culture *(Douglas and Wildavsky, 1982)*

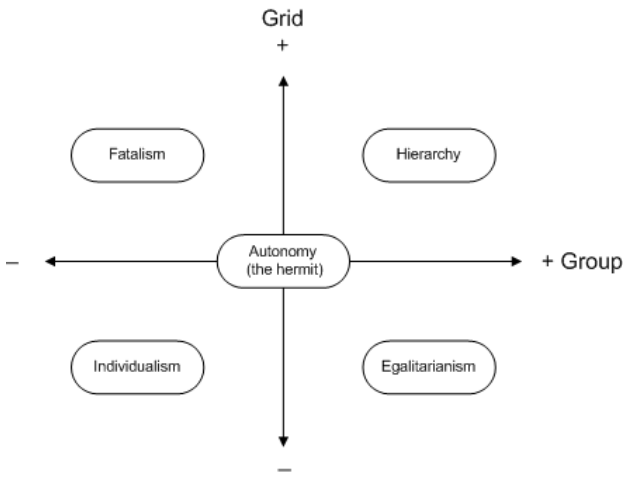


Douglas and Wildavsky modified the grid-group culture theory into the 'cultural theory of risk.' This evolved to a more integrated idea of the relationship between social organisation and culture. To

make the theory useful for politics, a third dimension was added, with the aid of Michael Thompson,[40] "to indicate the scope for individual manipulation" (considered by Douglas as a power dimension) (Douglas, 2007, p. 8). Another type of society was added at the crossing of the axes in the diagram: "the 'hermit:' the reclusive person who survives without social ties," as introduced by Douglas (2007, p. 8). These inclusions provided more options for the typology for cultures.

Figure 8

Cultural Theory Grid (Thompson, Ellis & Wildavsky, 1990)



Thompson and Wildavsky examined the relationships between cultures within the same community and identified that a community includes several cultures, with each of them being defined by the contrast with the others. "People with a shared culture keep 'their fire burning' by blaming the other cultures with moral failure" (Douglas, 2007, p. 8). CT assumes that four types of cultural bias are normally present in any society. Each is based on a type of stable organisation that could not endure if the cultural foundations of their organisation would become craggy. Therefore, all four will be at 'war' with each other, except for the 'hermit' since it has no social ties (Douglas, 2007, p. 8; Thompson, Ellis & Wildavsky, 1990).

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[40] Michael Thompson is director of the Musgrave Institute in London and honorary research fellow at the Department of Geography at University College London ("Cultural Theory", z.d.).

"Real dangers are only known after these have been materialized, in the meantime, one must act in the here and now to ward off harm. Each type of social life will prioritise their dangers, some higher, and others lower, because of their cultural bias." As Douglas and Wildavsky (1982, p. 8) further explain: This is integrated into the social organisation, which negotiates by risk taking, or by risk aversion, the best way to organise social relationships. Thus, if there is a certain type of society biased towards emphasising the risk of pollution, it is not that other types of society are unbiased, but instead, have another bias towards risks they emphasise for their cultural settings. They argue that, based on their way of life, people select their awareness of certain dangers to conform. The latter presumes that people do follow different types of social organisation and therefore are willing to take risk or to be risk averse governed by this. Douglas and Wildavsky (1982, pp. 8, 10) emphasise that to change risk selection and perception, one has to change the social organisation, therefore they promote an anthropological view to understand risk selection and perception.

The reason why the "source of safety, science and technology, have become the source of risk," is because of "a complex historical pattern of social changes has led to values that are identified as 'sectarian' being more widely espoused." The Western society, as Douglas and Wildavsky further claim, usually reverts to a typology of a bureaucracy contrasted with the market hereby referring to the USA and Western Europe. Based on the group-grid theory; a positional / hierarchical versus market / individualistic typology. Douglas and Wildavsky (1982, pp. 10, 90) argue that these are the centre of the society, whereas at the border of the society, a sectarian layer can be defined.

To explain Figure 8, the culture of hierarchy includes churches, industrial corporations, and political hierarchies. Their success depends on not allowing one-member's personal glory to be distinguished from the collective honour. Vice versa, no individual can be forced to take blame. Collectivising responsibility is done by making roles anonymously.

The opposite culture, the culture of the individualists, is considered as being entrepreneurial, hereby seeking optimisation towards all their transactions. To do this, a level of autonomy is required not only for the individual self, but also for all other individuals. Everyone has the right to assign to or withdraw from such transactions as long as these practices are mutually accepted. Such a society would

use a government to make rules for fair play, protection of contracts, and setting standard measures (Douglas and Wildavsky, 1982, p. 95).

Despite these differences, both types of culture have a shared view about danger. They prioritise threats that might affect the whole system and are sensitive of the public's confidence. Both cultures reasonably expect these threatening dangers in the long term. Both the hierarchy and individuals' culture are considered to be central institutions.

The border view is more related to sectarianism (egalitarianism): the people at the border gather in groups to shunt the power and influence of the establishment (the centre). They appeal towards the idea of the evil outside as a theological image which they use to justify their estrangement from the established orders, in this case technology (Douglas and Wildavsky, 1982, p. 102).

All three institutional types discussed above, have their part in public decision making with their own theories of how society should be organised as well as an explanatory philosophy to justify it (Douglas and Wildavsky, 1982, pp. 174, 175). The sectarian view in particular does not accept inequality in any form, whilst the individualists view does, as long there is 'turbulence' for competition. Hierarchy aims for stability. The pull and push between the different typologies keep the typologies alive and prevent a dominant typology. They have thus their own typology for risk which is based on their own world view. Douglas and Wildavsky (1982, pp. 180, 184), argue that the public interest groups (sectarianism) therefore strive for safety "because risk, like worldliness, is an ideal target for criticism: It is immeasurable, and its unacceptability is unlimited."

Sectarianism is thus highly risk averse and favours anticipation. They further argue that the changes we as Western society fear is because they are irreversible: "They cannot be undone and are as such impactful thus affecting society as such that government is expected to regulate these in favour of society" (Douglas and Wildavsky, 1982, p. 21).

Based on the above, it is concluded that Wildavsky's subjective risk is related to the type of society, their beliefs, and related perceptions. Wildavsky used CT to identify the type of society, and subsequently to determine their views, as well as their cultural bias and related risk appetite. By doing this, he and Douglas conclude that the USA is a border state where sectarianism prevails. They conclude that

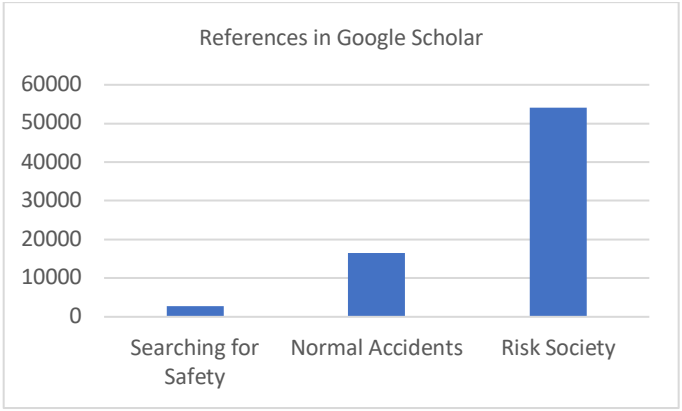
the sectarian view of not accepting inequality is linked to risk aversity, hence anticipation (Douglas and Wildavsky, 1982, pp. 192 – 195).

Society and risk perception

Societal risk was a topic one could not escape from at the end of the 1970s and '80s. Various large accidents happened[41] which all were related to high-risk technologies with adverse environmental and health consequences. Perrow, Beck and Wildavsky have all published books about dealing with these societal risks in the 1980s. Perrow's *Normal Accidents – Living with High-Risk Technologies* published in 1984 (Perrow, 1999), Beck's 1986 *Risikogesellschaft*, or in English translation *Risk Society* (Beck, 1992, p.1), and Wildavsky's *Searching for Safety* (Wildavsky, 1988a). Both Perrow's and Beck's books are more known and famous than Wildavsky's book which had to do with the 'zeitgeist' of the 1980s (Figure 9). This section deals with societal risk and the difference in risk perception of Perrow, Beck and Wildavsky as seen from a CT perspective.

Figure 9

Citations in Google Scholar



[41] Accidents like: Three Miles Island, Bhopal, Chernobyl, Herald of Free Enterprise, Piper Alpha, Exxon Valdez, to name but a few.

Technological growth in society has been generally exponential in the 20th century as Chauncey Starr[42] points out. Like Wildavsky, he argues that this technological growth has stimulated a parallel growth of socioeconomic benefits like health, education, and income which has increased the 'quality of life.' The costs of this progress show up in negative indicators of society: urban and environmental problems (as discussed in the previous chapter), poor physical and mental health and technological unemployment (human labour replaced by technology) (Starr, 1968, p. 1232).

Beck's book covers the transformation of our society from an industrial society into a modern society. He argues that we are at the start of the latter. The technological growth in this modern society has thus resulted in the growth of wealth. Beck argues that this growth is systematically accompanied by the social production of risk (Beck, 1992, p. 19). An argument with which Wildavsky would concur, considering his 'Axiom of Connectedness' (Wildavsky, 1988a, p. 4). This modern society, as argued by Beck, has to prevent, minimise, dramatize or channel risk whilst these are systematically produced as part of modernisation (Beck, 1992, p. 19). Beck defines risk as "a systematic way of dealing with hazards and insecurities induced and introduced by modernization itself," hence his naming of modern society as 'Risk Society' (Beck, 1992, p. 21). Examples are radioactivity, toxins, pollutants in the water, air and foodstuff along with the short- and long-term effects of flora, fauna and humans. He argues that ecological and high-tech risks have a new quality: They are no longer location specific (e.g., the industrial plant). By their nature, Beck further argues, these new quality risks endanger all forms of life on this planet (Beck, 1992, p.

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[42] Chauncey Starr (1913-2007) is considered to be a visionary. During his life he was at the forefront of ground-breaking work in nuclear energy, energy production & policy, and risk analysis. During WW II, he worked on the early development of nuclear energy. Starr is considered being a pioneer in the development of nuclear propulsion for rockets and ramjets, miniaturized nuclear reactors for space, and atomic power electricity plants. While dean of the UCLA School of Engineering and Applied Science, he wrote a landmark paper on how to weigh the risks and social benefits of various technologies that became the basis of modern risk analysis ("Chauncey Starr | Electrical, Computer, and Systems Engineering", z.d.)

22). Along the growing capacity of technical options, the incalculability of their consequences grows (Beck, 1992, p. 22).

This view is shared by Perrow whose book deals with living with high-risk technologies. He argues that high-risk systems have characteristics that no matter how effective conventional safety devices are, there is a form of accident that is inevitable: A 'Normal Accident'. He wants to abandon such high-risk technologies (Perrow, 1999, pp. 3, 5, 304).

These incalculable risks might be considered to be 'known unknown' risks called black swans[43]. Because of the lack of knowledge, there is disagreement whether catastrophes will materialise. Wildavsky (1988a, p. 91) argues that "knowledge is incomplete and uncertainty inherent, especially concerning low-probability events." Considering the reverse Cassandra[44] rule, all possible threats must be regarded and may be misused by everyone by offering an alternative (highly improbable) catastrophic scenario. As Wildavsky (1988a, p. 92) claims: "The argument from catastrophe can be used to defeat all technological progress."[45]

This shows a division of view towards societal risk. Wildavsky considers himself a modified Cornucopian. The Cornucopian view promotes mankind's creativity, for which resources are manipulable, and what makes the world a richer and safer place. The opposite view, the Catastrophist view, sees dangers in the depletion of non-renewable resources, irreplaceable damage to the natural environment, envisaging ecological disasters deeply damaging to human life (Wildavsky, 1988a, pp. 215, 216). Beck and

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43 Black swans are rare, have an extreme impact and with hindsight predictable (Taleb, 2010, p. xxii).

44 Cassandra is in Greek mythology, the daughter the last king of Troy. Cassandra was loved by the god Apollo, who promised her the power of prophecy if she would comply with his desires. Cassandra accepted this, became a prophet, but then refused Apollo her favours. Apollo took revenge by ordaining that Cassandra's prophecies should never be believed. She accurately predicted such events like the fall of Troy, but her warnings were not believed (The Editors of Encyclopaedia Britannica, 1998).

45 Although not mentioned, it can be seen as a counter argument towards Perrow's view. Wildavsky disagreed with Perrow about his definition of risk (Wildavsky, 1986b, p. 439).

Perrow are to be considered catastrophists in this view. Perrow's and Beck's view is of a glass half empty (or complete empty), whilst Wildavsky's view is of a glass half full.[46] Wildavsky acknowledges that this growth has also a down side but disagrees[47] with the alarmist tone of voice this is brought by the catastrophists.

Risk Perception

Based on CT, there has indeed been something new in the social relationships which are related to the rise of the (radical) egalitarianism[48] and this view of the world. Seen from a CT perspective the catastrophist view against the cornucopian view is also considered as egalitarianism against individualism. Beck can be labelled as an egalitarian and Wildavsky as an individualist (Adams, 1995, p. 184). Perrow can be labelled as an egalitarian as well. When taking the topic 'nature,' the egalitarian speaks of natural resources and sees mankind trapped in a downward spiral of resource depletion. Egalitarians are in conflict with the individualists who speak of raw materials and who favour the human ingenuity in the intangible. This egalitarian view of the world has a strong relationship with societies risk perception: being risk averse. A clear example of difference in world view between Wildavsky and Perrow can be read in the 'Afterword' of Perrow's book which includes a review of Wildavsky's *But is it true*…. (Perrow, 1999, pp. 366-367).

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[46] "Overwhelming evidence shows that economic growth and technological advance arising from market competition have in the past two centuries been accompanied by dramatic improvements in health, large increases in longevity and decreases in sickness" (Wildavsky, 1988, p. 7).

[47] "Has there ever been, one wonders, a society that produced more uncertainty more often about everyday life? It isn't much, really, in dispute- only the water we drink, the air we breathe, the food we eat, the energy that supports us. Chicken little is alive and well in America. Evidently, a mechanism is at work ringing alarms faster than most of us can keep track of them. The great question is this: Is there something new in our environment or is there something new in our social relationships" (Wildavsky, 1979, p. 32)?

[48] Egalitarianism is in the book *Risk and Culture* of Douglas and Wildavsky identified as sectarianism but has changed later to egalitarianism as CT further developed (Thompson, 1999).

Wildavsky and Dake (1991, p. 42), identify that there are various theories around dealing with risk perception (Table 7):

Table 7

Risk perception theory perspective

Theory of Risk perception perspective	Explanation
Knowledge theory	The often-implicit notion that people perceive technologies (and other things) to be dangerous because they know them to be dangerous (Wildavsky and Dake, 1991, p. 42)
Personality theory	The risk taking or risk aversity tendencies of individuals (Wildavsky and Dake, 1991, p. 42)
Economic theory	The rich are more willing to take risks stemming from technology because they benefit more and are somehow shielded from adverse consequences (Wildavsky and Dake, 1991, p. 43)
Post-materialist theory	Because of improved living standards, the new rich are less interested in what they have (affluence) and what got them there (capitalism) than what they think they used to have (closer social relations) (Wildavsky and Dake, 1991, p. 43)
Political theory	Public reactions to potential hazards are accounted to the controversies over risk struggles over interests, (who is holding office) or party advantage (Wildavsky and Dake, 1991, p. 43)
Cultural theory	Individuals choose what to fear (and how much to fear it), in order to support their way of life. In this perspective, selective attention to risk, and preferences among different types or risk taking (or avoiding), correspondent to cultural biases (the individual's worldview) (Wildavsky and Dake, 1991, p. 43)

Wildavsky and Dake (1991, p. 50), argue that cultural biases provide predictions of risk perceptions and risk-taking preferences that are more powerful than measures of knowledge and personality and at least as predictive as political orientation. This is not only their own opinion but also from others who support CT (Shin et al., 1989; Gastil et al, 2005).

Douglas and Wildavsky elaborate on involuntary and voluntary risks when explaining how people perceive risk. They argue that involuntary risks are the risks that one has to endure without any control and of which they could not get away from. Starr is quoted when defining involuntarily risks: "risks imposed by the society in which the individual lives." The difference between the two is that one has control over voluntary risks.[49] They argue that there are always unsuspected dangers, new inventions to make things safer and which turn out to be more dangerous (e.g., asbestos). Everything one does might prove risky, so why are unknown involuntary risks taken without problem, and is a lot of fuss made about others? They draw attention to the fact that the voluntary risk taking does not stay with the individual but also affects others, these risks taken are likely to spread danger to others. Voluntary and involuntary risks do not have a rigid border but are defined on cultural values and rules of accountability. Depending on the type of society, or way of life, (i.e., hierarchy, individualism, or egalitarianism), this border will differ (Douglas and Wildavsky, 1982, pp. 18, 19).

They therefore conclude and, vindicated by Beck (1992, p. 23): Risk is a construct (Douglas and Wildavsky, 1982, p. 20). Risk is defined as "a joint product of knowledge about the future and consent about the most desired prospects". The consent is related to the social perception of the risk, or in other words, the level of acceptability of it (Douglas and Wildavsky, 1982, pp. 5-6).

Societal risk

In *Risk & Culture*, Douglas and Wildavsky describe the rise of sectarianism (egalitarianism) in the USA from the 1960s up to the early '80s (see Appendix D). This rise did not stop in the early 1980s. It

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[49] Voluntary risks are i.e., the execution of high-risk sports, like bungee jumping, mountaineering, rallying, to name but a few, as well as, lifestyle related habits like drinking, smoking, eating junk food (Douglas and Wildavsky, 1982, pp. 18, 19).

continued up to this moment in time where there is a divide in Western society, or modern society, between individualists versus egalitarians with a weakened hierarchy.[50] Wildavsky explains in his book *The Rise of Radical Egalitarianism* (Wildavsky, 1991), that this rise in the USA further has increased "by the internal transformation of the Democratic and Republican parties so that Republicans are almost entirely individualistic and hierarchical while Democratic party activists are largely egalitarian" (Wildavsky, 1991, p. xxxiv).[51] This divide is clearly seen now in Western Europe and even better in the American politics where in the 2020 elections only about one-in-five Trump and Biden supporters say they share the same core American values and goals (Pew Research Centre, 2022).

Both Wildavsky and Beck, albeit with a different view, detect a trend which Wildavsky labels 'individualism' and Beck 'individualization of social inequality': the individualization of society. Beck argues that these new individuals make temporary coalitions between different groups and different camps that are formed and dissolved. These alliances are generally focused on single issues, oriented towards specific situations or personalities and susceptible to the latest social fashions (in issues and conflicts which, pushed by the mass media, rule the public consciousness just as the seasonal fashion shows) (Beck, 1992, pp. 100, 101) resulting in swing voters who base their vote on the 'theme of the day' (Beck, 1992, p. 190).

Beck explains that in the USA the growing public discontent with the obviously destructive consequences grew into a broad protest against industrialisation and technification. The genesis for this in the USA was, as he calls it "the biological research into the destructive consequences of industrialization for natural biosystems" (i.e., Carson's *Silent Spring*). He further argues that the goals and themes of the environmental movement became larger and have resulted in a general protest against the conditions and

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[50] Fatalists and the hermit are for discussion purposes omitted.

[51] It must be noted that the book expresses Wildavsky's view: He clearly does not approve radical egalitarianism (Wildavsky, 1991 p. xxxv).

prerequisites of industrialisation itself hereby focusing on threats that were not tangible anymore and would only be realised in further generations (Beck, 1992, p. 162).

He points out that these threats have now a scientific nature. The threats can only be identified by, as Beck calls them (1992, p. 162), "the sensory organs of science being theories, experiments, measuring instruments in order to become visible and interpretable as threats at all". Science is used by public interest groups as a means to counter the same science they oppose with different principles and different interests, hereby reaching exactly opposite conclusions. Thus, social risks are constructed by the temporary coalitions based on their way of life (Beck, 1992, p. 161).

Both Wildavsky and Beck also identify another trend: What Wildavsky's calls 'radical egalitarianism' and Beck calls 'corporatism': The grey area where organised power of public interest groups is heavily influencing political decision making (Douglas and Wildavsky, 1982, p. 167; Beck, 1992, p. 188). Such pressure groups use a hierarchical culture to organise themselves, for influencing political decisions as well as pushing political themes within political parties (Beck, 1992, p. 188). An activity which is also acknowledged by Perrow (2007, p. 9).[52]

Another trend seen from late 1970s and especially in the 1980s was the rise of neo-conservatism within the political spectrum of the USA and Europe. This was related to the effects of some geopolitical movements that happened in the 1970s (see chapter 'Neo-conservatism and neo-liberalism'). Environmental, Health and Safety policies have thus become risk averse, firstly in the USA and subsequently Europe, because of (Vogel, 2012, p. 3):

1) The public outcry as result of adverse environmental effects on public health,
2) Political decisions to provide an answer to the aforementioned,
3) The rise of egalitarianism (Wildavsky, 1991) / corporatism (Beck, 1992) and their subsequent influence on the political agenda, and

[52] "While Congress is the arm of the government that is closest to the people, it is also the one that is most influenced by corporations and local interest groups that do not have the interests of the larger community in mind" (Perrow, 2007 p. 9)

4) The rise of neo-conservatism providing the means for the rise of the previous mentioned points.

Beck argues that global risks have three main characteristics (Beck, 2009, p. 52):

1) They are omnipresent which means that global risks are not limited to:
    a. National borders or even continents,
    b. Time (e.g., long latency period for nuclear waste),
    c. Linearity of cause and effect, they involve complex processes.
2) Their consequences are incalculable, their risks are hypothetical based on scientific unknowns and normative disagreement.
3) Their destructive impacts cannot be compensated, or in other words, their impact cannot be made good anymore (e.g., climate change).

Beck (2009, p. 52) explains that these global risks are covered by the precautionary principle through prevention, and by anticipating and prevention of risks whose existence has yet to be demonstrated: Wildavsky's 'Anticipation' (1988a, p. 77).

Le Coze (2022, p.129), makes a distinction in the types of global risk:[53]

1) Anthropocene risks,
2) Transhumanism risks,
3) Existential risks.

Beck reflects (2009, p. 47) that "ironically, our continually perfected scientific-technological society has granted us the fatal insight that we do not know what we do not know." This is what Wildavsky considers a 'qualitative surprise' (Wildavsky, 1988a, p. 93) or, as recently being coined: 'Blue swan' (Hancock, 2023, p. 454). Beck claims that these unknown unknowns are what makes it the source

[53] Anthropocene is a scientific terminology framing the underlying causes for what is known as global warming triggering climate change due to human industrialisation. Transhumanism is the project of alleviating mankind to many of its limitations by the use technoscience. Existential risks are related to the events that endanger the survival of humanity (Le Coze, 2021 p. 130).

of the dangers that threaten humanity (Beck, 2009, p. 47), Wildavsky explains that he believes that the consequences of technological progress will make life safer but that a qualitative surprise to human life may very well occur. However, he argues, this will be the same when taking a catastrophist view like Beck and Perrow. Because, as Wildavsky further explains, "the uncertainty principle identifies that consequences and interactions among past and current undertakings must, to a large amount remains indefinite. Thus, being alert and being capable to deal with the surprise is of the essence" (Wildavsky, 1988a, p. 216).

Wildavsky promotes a neo-liberalist view in favour of market competition to enhance resilience, by claiming that "competition will increase income in wealth and subsequently people's well-being." Beck disagrees with this and sees this neo-liberal view as one of the causes of the global risks since governments have no longer control over economic decisions which are now in hands of the market forces (Beck, 2009, p. 62). Perrow agrees: "Whereas the first deregulation of industries led to more companies and more competition, because of weakened antitrust concerns in the government, the number of companies decreased and consolidated." He points out that we live in a highly interconnected society, but in the case of disasters the connections are largely ones of dependency rather than interdependency (Perrow, 2007, p. 7).

One may conclude that societal risks have become global risks because of the outcome of a combination of the rise of Egalitarianism with a risk averse view and the deregulation of governments as part of the neo-liberal view, hereby increasing competition, but as part of the same deregulation allowing concentration of industries, hereby losing control over economic decisions and means of societal protection.

Neo-conservatism and neo-liberalism

This chapter explores the rise and fall of neo-conservatism and neo-liberalism and Wildavsky's public policy views thereof. It provides further context towards the previous sections of the deregulation of legislation and the emergence of the global risks.

Neo-conservatism in the USA goes back to the interpretation of its constitution by founding fathers Jefferson and Hamilton. Whereas the first wanted a limited government, considering farmers as being the ideal citizens,[54] and preferring self-sufficiency over any form of governmental support, the latter wanted a vigorous government to help the USA to develop, and preferred private-public partnerships to support the economy and society (Troy, 2009, p. 23; Menand, 2023). Neo-conservatism is being considered to be a moral-political rationality, whilst neo-liberalism is being considered to be a market-political rationality (Brown, 2006, p. 691). Neo-conservatism started as a movement with ideals, based upon two groups of which one harking back to the small definition of the constitution, and a group who were not 'at home' anymore with the Democrats anymore (Troy, 2009, p. 37, 38; High, 2009, p. 481). Wildavsky was one of the latter. The movement morphed over the years into an ideologic neo-liberal trinity of the religious right, big industry (big oil especially), and neo-conservatism during the presidency of George Bush jr. (High, 2009, p. 475).

From the 1930s up to the '70s, the dominant economic theory of Keynesianism[55] prevailed in the Western society. Keynesian based economic policies were scrutinized in the 1970s as a result of a severe downturn of the economy in both the USA and Europe. This was catalysed by the oil embargo (because of the Arab-Israeli war), and the subsequent recession of 1973-74.[56] There was a structural crisis of capitalism ongoing: The Keynesian economic policies were abandoned, under the belief that neo-

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[54] E.g., the idealistic view as displayed in the TV series 'A Little House on the Prairie' (Menand, 2023)

[55] This theory was based upon Keynes's book *The General Theory of Employment, Interest and Money*, as published in 1936. Keynesian economics is a theory of aggregate demand and of the effects of aggregate demand (the total demand for goods and services produced within the economy over a period of time) on real output and inflation (Blinder, 1988, p. 280).

[56] The New York stock exchange lost almost half of its value. The economy of the USA and Europe was subject to stagflation: high inflation and low growth (Menand, 2023).

liberalism[57] could improve its profit and accumulation performance of capital and was therefore less of a threat to the ruling classes & economic elites (Campbell, 2005, p. 187; Harvey, 2007, p. 15; Menand, 2023).

The threat to the ruling classes & economic elites is considered one of the reasons that Reagan was supported in his election as president. Reagan was considered a neo-conservatist per sang, based on his doings whilst being Governor of California[58] (Troy, 2009, pp. 17, 18).

His presidency started the 'Reagan Revolution,' based on 3P's: Patriotism, Prosperity and Peace (Troy, 2009, p. xvi). The main ideas of this revolution were control of inflation through control over monetary aggregates and then through inflation targeting, deregulation of product, labour, financial markets, and lowering marginal tax rate, thus pursuing a neo-liberal agenda (Troy, 2009, p. 68; Wolf, 2023 p. 57). Because of actions taken by the Federal Reserve in 1982, the recession ended in the USA and the economy rocketed. The USA changed. The resulting great prosperity of the mid 1980s onwards has led to a more consumer-driven, celebrity-oriented, and individual based society as it is today (Troy, 2009, p. 70).

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[57] "Neo-liberalism is a theory of political economic practices that proposes that human well-being can best be advanced by liberating individual entrepreneurial freedoms and skills within an institutional framework characterized by strong private property rights, free markets, and free trade. The role of the state is to create and preserve an institutional framework appropriate to such practices." (Harvey, 2007, p. 2). In the 1930s, during the Great Depression, neo-liberalism emerged by means of ideas of a group of economics from the University of Freiburg, called Ordoliberalism. (Dold & Krieger, 2021, p. 341). After WW II, neo-liberalism got more traction, by means of the works of Hayek. His book *Road to Serfdom*, a polemic against socialism, his founding of the global think-tank Mont Pèlerin Society in 1947, and his influence at the University of Chicago in the 1950s and '60s (Caldwell, n.d.; Venogupal, 2015, p. 168).

[58] He became famous by opposing the sixties' social and political revolutions. He was in favour of America's war in Vietnam, doubted the civil rights revolution, resisted women's liberation, and challenged radical students. He was considered to be "the conservative Kennedy, charismatic enough for the masses, ideological enough for the partisans and intellectuals" (Troy, 2009, pp. 16, 17)

During the second half of the 1980s, Wildavsky's underpinning foundation of resilience became reality: Market competition did work, there was a cumulation of wealth and knowledge and deregulation commenced, hereby taking away various anticipatory legislation (1988a, p. 75).

Deregulation continued in the USA but at the end of the 1980s, America had ended up in a recession again. It is argued that the saviour of neo-liberalism was the ending of the Cold War, the subsequent sudden collapse of the USSR, and its satellite countries between 1989 and 1991. It showed that communism (socialism in the view of the USA) was bankrupt. Focus came on internationalising neo-liberalism which was considered the new order by both political left and right: Globalisation was born (Gerstle, 2022, p. 187). The so called 'Washington Consensus' was established, a plan based on international implementation of neo-liberal principles: A true economic expansion was the result (Gerstle, 2022, pp. 156-158). One may argue that Wildavsky's view was justified once more since wealth was increased globally hereby fostering resilience on an even wider scale and many independent minds were engaged in the discovery process for safety (1988a, p. 75).

With hindsight, the change in power in the USA in 2000 was the beginning of the end for neo-liberalism. The 9/11 terroristic attack at New York's WTC would shock not only the USA but also the world. It resulted in two unwinnable wars in Afghanistan and Iraq. The rationale for these wars was an ideology that democracy and free markets were intertwined. It was strongly believed that this would benefit Iraq after the war hence a government led reconstruction plan was not required since market forces would take care of this. Long story short: The reconstruction of Iraq did turn out in a debacle (as did Afghanistan later) and started the erosion of the neo-liberal order in the USA (Gerstle, 2022, pp. 191 - 205). Based on Wildavsky's work, one may argue that he would have disagreed with this approach. Wildavsky (1979b, p. 173) clearly points out that markets are imperfect thus a form of government intervention is always required. Based on his collaborative work with Pressman on *Implementation*, he would have had many questions regarding the lack of a government led construction plan and the viability of the proposed alternative (Pressman & Wildavsky, 1973). In addition, he was averse of any form of

totalitarianism and with his faith in the prospects of a democratic political culture, he would, if been alive, have been opposed to these policies and would have ridiculed these.[59]

After the financial institute Lehman Brothers was forced to shut down, US government had to intervene involuntary to prevent further damage, hereby contradicting its neo-liberal policies. It appeared that after the bankruptcy of the Lehman Brothers, the financial world was on the verge of global financial annihilation. It would have been graver than the Great Depression of the 1930s if government had not intervened (Gerstle, 2022, p. 220). These crises are now referred to as the Great Recession (Gerstle, 2022, p. 228).

The effects of the Great Recession were not in isolation in the USA. Years of increasing economic imbalance between the have and the have nots of the globalisation resulted in distress, political anger, and protest. Various protest groups came to surface. A new left emerged with the Democrats arguing of bringing back a New Deal Program, and a new right (Alt-right) emerged with the Republicans talking about 'deep state' that engineered outcomes for the rich elites. Ethnonationalist racial modified populism had emerged, believing that a global multicultural elite was undermining America's best white citizens, (Gerstle, 2022, pp. 222 - 229).

The neo-liberal order further crumpled by the implementation of a protectionist program to exclude the USA from its historical position as the leader of the free world. (Gerstle, 2022, p. 268 - 277). One may argue that the COVID-19 Pandemic was the last push to the decline of the neo-liberal order. The Pandemic showed that government was needed to address the pandemic and its related economic and social adverse effects. It was clear that a neo-liberal approach would no longer work (Gerstle, 2022, p. 278 - 290). The invasion of Ukraine in February 2022 acted as catalyst and crumbled the neo-liberal order even

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[59] Like he did in "The theory of Pre-emptive Revolution" which, although written late 1960s, include various similarities towards the validity of the US Government's arguments to invade other countries: Just change "threat of communism" in "threat of terror" (Wildavsky, 2003, pp. 14, 489).

further by increasing the sense for National security,[60] hereby being less dependent on other countries (Gerstle, 2022, pp. 281 - 290).

The aforementioned crises have resulted in a diminishing trust in democratic institutions, the global market economy, and political and economic elites, in the US and Europe. This has shown itself in protectionism, hostility toward immigration, and, above all, a growing leaning toward authoritarian populism. It further shows that neo-liberalism is at the end of its lifetime, clearly illustrated by the governmental interventions in the USA and Europe to aid their citizens and economies (Gerstle, 2022, p. 290).

The emergence of neo-liberalism and globalization resulted in the emergence of the already discussed global risks. Next to these, more global risks can be identified: Changing demographics, industrial and economic fragmentation, complexification, and mass digitalisation. It is predicted that these will increase in pace between the 2030s and '40s (Pariès, 2022, p. 105).

As Pariès (2022, p. 106) observes, "one thing is certain: the scale and momentum of the changes underway are those of the major revolutions in history. In other words, this is a metamorphosis of society" hereby echoing Beck and his alarmist tone of voice. This metamorphosis, Pariès argues, will increase complexity, hence uncertainty and therefore also its potential for quantitative and qualitative surprises (black and blue swans). Pariès predicts that "accidents will become rarer, but increasingly of the black swan type" (2022, p. 109).

Despite Wildavsky having appearances against him considering his neo-conservative view and a neo-liberal based resilience strategy. His answer for society to stay resilient, thus not by tolerating known and avoidable sorts of failure, but through economic growth and technical progress, remains valid because of the aforementioned predicted metamorphosis of society by Pariès. Because of economic growth and technical progress, society learns to cope better with adversity, thus becoming more resilient.

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[60] National security means that governments intervene in markets to protect their country (Gerstle, 2022 p. 281 - 290).

"Catastrophes can always occur. But where there is progress, we will have a much greater body of wealth. Knowledge and coping experience to draw upon: thus, growth and progress reduce the chances that 'ultimate' catastrophes actually will be ultimate" (Wildavsky, 1988a, p.95).

Findings and Analysis – Influence in the safety discourse

The safety discourse

This chapter explores the safety discourse, Wildavsky's place in it, and the influence of *Searching for Safety*.

Firstly, the safety discourse will be viewed from the inside-out. With this view, the safety discourse is, what is argued by others, being safety science.[61] This is considered to be a young scientific discipline (Le Coze et al., 2014, p. 1). The discipline's emergence appears to be vested with Heinrich's book *Industrial Accident Prevention* in 1931, which is considered to be the genesis of an academic and a practical discipline (Dwyer, 1992, p. 266). Heinrich (1941, p. 16) describes that "accident prevention can be portrayed as a science and as a work that deals with the facts and natural phenomena."

The definition as provided by Rae and Dekker (2019, p. 1) about 90 years later, is not that much different. They define safety science as the interdisciplinary study of accidents and accident prevention. They argue that it contains theories inspired by engineering, physical sciences, epidemiology, sociology, psychology, anthropology and more.

The above definitions are rather ill defined. Aven (2014, p. 15) has a broader view and argues that safety science is a concept: It can be viewed as discipline and as source of knowledge. He quotes the definition of Hansson to explain what his understanding of science is.[62]

Aven (2014, p. 18) argues that the knowledge part of safety science is to understand the world from a safety perspective and how to understand, assess and manage this world. He views safety science as a multi-disciplinary discipline as being the total sum of relevant safety educational programmes,

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[61] Not to be confused with the other safety science: The journal 'Safety Science' (www.elsevier.com/locate/safety).

[62] "Science (in the broad sense) is the practice that provides us with the most reliable (i.e., epistemically most warranted) statements that can be made, at the time being, on subject matter covered by the community of knowledge disciplines, i.e., on nature, ourselves as human beings, our societies, our physical constructions and our thought constructions" (Aven, 2014 p. 17).

journals, papers, researchers, research groups and societies to obtain this knowledge, safety being the defined object for study (Aven, 2014, p. 17). Thus, safety science is the study of safety.

And that is where it goes wrong, warns Hollnagel. He argues that safety unlike celestial objects, matter, mental faculties, organisations, or goods and services, to name but a few, has not a representative agreement about its definition, hence being multi-interpretable, and furthermore, safety is intangible (Hollnagel, 2014, p. 21). He points out that if it is argued that safety is about avoiding incidents and accidents, like previous definitions, safety therefore should be considered as a set of methods, principles and practices that have been developed to identify and mitigate hazards: Safety science is about risks and hazards. It thus focusses on conditions that have no safety at all, instead of safety (Hollnagel, 2014, p. 23).

Hollnagel (2014, p. 24) argues that safety science should study what is present and not what lacks. It should study safe operation or working safely. The study should entail how people work both as individuals and as collective. Furthermore, it should assess how organisations function in collaboration with other sciences with the same focus but with different principles and concerns.

Hale agrees but considers safety science as a more technical oriented science. "Safety science must belong to engineering disciplines, albeit with large doses of social and organisational engineering." He argues that "it should be a discipline that lives by designing and changing things, workplaces, products, working groups and to understand how these things work and interact" (Hale, 2014, p. 68).

Considering Wildavsky's Axiom of Connectedness,[63] safety science must cover both safety and harm. An argument which Rae et al. concur since they argue that safety science, in their view reality-based safety science, should focus on the aspects of work that makes it safe or unsafe. They consider the domain of work,[64] the core object of safety science (Rae et al., 2020, pp. 4, 5).

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[63] Safety and harm are intertwined in the same acts and objects (Wildavsky, 1988, p. 4).

[64] Being a concept of engineering and design, management, regulation, analysis, social interaction and many more (Rae et al, 2020, pp. 4, 5).

Secondly, if one views from the outside-in, one should expect safety science being an independent research discipline. Aven argues that safety science should be a scientific discipline with its own researchers. Following this train of thought, scientist of this discipline should thus have an MSc or PhD (or higher) in safety science. The listed 'safety science' authors in Table 8 are not considered to be safety scientist by discipline as one would expect when following the aforementioned logic. One may argue and conclude that the object of safety is merely described by other disciplines than 'safety science' itself. Safety discourse provides a better definition to the subject.

Table 8

'Safety science' authors

Name Author	Title Book / Article	Discipline
H. W. Heinrich	*Industrial Accident Prevention*	Engineering
C. Perrow	*Normal Accidents*	Sociology
J. Reason	*Human Error*	Psychology
J. C. Le Coze	*Post-Normal Accidents*	Science and engineering of risk
S. Dekker	*The Field Guide of Human error*	Experimental and organizational psychology
J. Groeneweg	*Controlling the Controllable*	Experimental psychology
J. Rasmussen	*Risk management in a dynamic society: A modelling problem*	Electronic and control engineering
R. Cook	*How Complex systems fail*	Medicine
D. Woods & E. Hollnagel	*Joint Cognitive Systems*	Cognitive Psychology & psychology
K. Weick & K. Sutcliffe	*Managing the Unexpected*	Organisational behaviour, psychology and business administration
A. Hopkins	*Organising for Safety*	Sociology
R. Amalberti	*Navigating Safety*	Medicine, physiology and ergonomics

Name Author	Title Book / Article	Discipline
D. Vaughan	*The Challenger Launch Decision*	Sociology
S. A. Snook	*Friendly Fire*	Behavioural science & leadership
S. D. Sagan	*The Limits of Safety*	Political science
M. Douglas & A. B. Wildavsky	*Risk & Culture*	Anthropology & political science
A. B. Wildavsky	*Searching for Safety*	Political science

One may argue that by using the term safety science, it will act as a self-fulfilling prophecy. By re-iterating it over and over, someone may start to believe that it really exists. When comparing it with established disciplines of science,[65] this is not the case. Rae et al. concurs. They argue that safety is not a fully self-governing research discipline, it has neither tenets nor conventions for design, execution or publication of research. They point out that safety science draws on many research disciplines for ideas, perspectives and methods. Their solution, a commitment even, is to follow the methodological standards and norms of the parent discipline and to make findings that advance the parent discipline then apply it to safety (Rae et al., 2020, p. 7).

Whether it is inside-out or outside-in, the topic safety in the safety discourse is mainly at micro level when considering Martin-Breen & Anderies (2011) definition of micro, meso and macro: Safety research is mainly about how work activities are executed, or go wrong, within an organisation set in a socio-technical system.

Searching for Safety can be classed as a macro level book in the safety discourse since despite examples provided on an organisational level, the main message is related to a macroeconomic public policy of how to deal with risk and uncertainty in society. This macro level may even be coined as 'Global Safety': Safety on a societal even global level.

[65] Science dealing with celestial objects, matter, mental faculties, etc.

Pariès argues that the safety discourse is lacking progress towards 'Global Safety' since it is not addressed at the right level. The major changes in the world are questioned by researchers and specialists from various disciplines, studied from numerous perspectives but not with safety as the number one perspective. The global risks are discussed in influential think-tanks, COPs, and between World Leaders, but exclude safety. He advises to raise safety issues in these places of influence, or to create new places of influence since major changes are played out in circles where safety is no topic that that is discussed. To do this, safety experts need to start influencing and lobbying: Adopting politics (Pariès, 2022, p. 110).

The ideas posed in *Searching for Safety* have resonated downwards into the micro-level of the safety discourse: Wildavsky may be seen as the linking pin between RE, HRO and NAT.[66] His view on resilience is considered by some of as being the genesis of RE (Herrera, 2023). Furthermore, his 'Axiom of Connectedness' resonates with RE's view on focusing what goes well, as well as what goes wrong. The ideas posed in *Searching for Safety* have been adopted in HRO as is further detailed below (Sagan, 1993; Weick, 1999). One can even argue that Wildavsky is even aligned with Perrow's NAT since both concur that adding more and more safety measures to complex systems will decrease safety (Wildavsky, 1988a, p. 139; Perrow, 1999). However, Perrow considers *Searching for Safety* as being HRO based on Sagan's arguments (Perrow, 1999, p. 369; Sagan, 1993).[67]

Sagan considers Wildavsky's call to search for safety in favour of anticipation, an element to be a part of HRO (Sagan, 1993, p. 16). The trial-and-error part of Wildavsky's promoted resilience, is another element adopted by HRO. The same counts for Wildavsky's view on when to use resilience and when to use anticipation (Weick, 1999, p. 43). In addition, Wildavsky is cited and referenced to make the point that the commitment to resilience by a HRO is the ability to improvise (Weick, 1999, p. 47).

Despite being placed on a different level, Wildavsky fits in the list of 'Giants' of the safety discourse: Broad theorists with persuasive ideas. Heinrich, Hollnagel, Rasmussen, Hudson, Leveson,

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[66] RE = Resilience Engineering, HRO = Hight Reliable Organisation theory, NAT = Normal Accident Theory

[67] Perrow refers to HRO as HRT: High Reliability Theory (Perrow, 1999, p. 369)

Perrow, Reason, Turner, Weick, etc. are considered being these giants. As Rae et al, argue: "Whatever they lack in research rigor, they make up with compelling metaphors. They have the power of naming things, and the names once bestowed, hold and perpetuate the power of the giants" (Rae et al., 2020, p. 2).

Resilience Engineering

RE is considered to be a discipline within the safety discourse that emerged in the early years of the 21st century. A group of like-minded researchers gathered together for a symposium in Söderköping, Sweden in 2004. The objective of this symposium was to provide an opportunity for experts to meet and debate the present and future of RE as well as to provide a tentative definition of organizational resilience (Hollnagel et al., 2006, p. xii).

RE considers itself being "a paradigm for safety management that focusses on systems coping with complexity and balancing productivity with safety" (Patriarca et al., 2018, p. 79). Bergström and Dekker (2019, p. 410) explain that the discipline emerged from CSE which is based on the works of Rasmussen, Hollnagel and Woods that has its roots in the 1970s and '80s. RE has a focus on organisational resilience (Bergström and Dekker, 2014, p. 18). Thus, having a main focus on the micro-level in the safety discourse as well. Notwithstanding the latter, the macro level of the safety discourse appears also as an area of interest with an initial focus on societal resilience: Governmental crisis management (Bergström, 2017). In recent years, an emergence towards a focus on global risk can be witnessed within RE (Le Coze, 2019a, 2023; Pariès, et al., 2019). Based on Perrow's NAT, this focus is mainly on dealing with complexity, interconnectedness and synchronicity in the macro safety discourse (Global Safety) (Le Coze, 2023).

Within the safety discourse, it is questioned whether RE is actually that new and not a recycled theory of HRO that emerged in the 1980s to counter Perrow's NAT. Hopkins argues that HRO and RE are the one and the same. He points out that the four cornerstones of RE are central features in HRO[68]

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[68] These cornerstones being:

- Knowing how to respond to regular and irregular disruptions and disturbances;

(Hopkins, 2014, p. 10). Haavik et al. (2019, p. 479), argue that both theories co-exist together. Their difference can be seen as two different schools of thought when taking an essentialist view. There is not such a difference except for the view towards safety (Table 9).

Table 9

HRO and RE

	HRO	RE
Purpose	Both HRO and RE pay attention to the organization's strategies and abilities to cope with complexity by paying attention to the social conditions (Haavik et al., 2019, p. 479)	
View	Safety as a dynamic non-event	Safety as a dynamic event[69]
Roots	Rooted in the social sciences, more specifically social psychology, organisational psychology, sociology and political sciences (Le Coze, 2019b, p. 2).	Rooted in the movement of engineering, human factors, ergonomics and cognitive (system) engineering (Le Coze, 2019b, p. 2).
Focus	Reliability – Robustness[70] against failure (Pariès, et al., 2019, p. 510)	Resilience – Balanced robustness against variability (Pariès, et al., 2019, p. 510)

- Knowing how to monitor of the things that might become a threat;
- Knowing how to anticipate developments, threats and opportunities;
- Knowing how to learn from experience (Hopkins, 2014, p. 10).

[69] Dynamics refers to work processes (timely human adjustments), and non-events refer to the outcome of those work processes (no undesired events) (Haavik et al., 2019, p. 483).

[70] A property of a system appears to be 'robust' for a given number of disturbances if it is invariant for this number. A system has robust as well as fragile properties (i.e., Wildavsky's 'Axiom of Connectedness (Pariès, et al., 2019, p. 510; Wildavsky, 1988a, p.4).

	HRO	RE
Application	To efficiently prevent organisational failures and safely recover from these (Pariès, et al., 2019, p. 510)	To focus on how organisations build daily successes during disturbances and how these are used to evolve, readapt and reinforce the organisation (Pariès, et al., 2019, p. 510)

Hopkins further questions why the RE theorists have not acknowledged HRO theorists or even clearly distinguish their theories from HRO theories. He is surprised that the RE theorists make almost no reference to HRO such that it appears that those theories do not exist at all. Hopkins makes a strong argument: When assessing two literature review articles, one related to resilience (Bergström et al., 2015), the other to RE (Patriarca et al., 2018), neither acknowledges HRO nor do they acknowledge the earlier emergence of resilience. The selection of literature of the first study was related to technical safety topics and human factors and ergonomics. The second study's literature review was related to the status of research and future challenges of RE and includes only authors associated with RE from 2004 onwards. One may argue that RE mainly references its own work. Resilience as a concept was already earlier used in political science and public policy themes from the 1970s onwards (Martin-Breen & Anderies, 2011, p. 5).

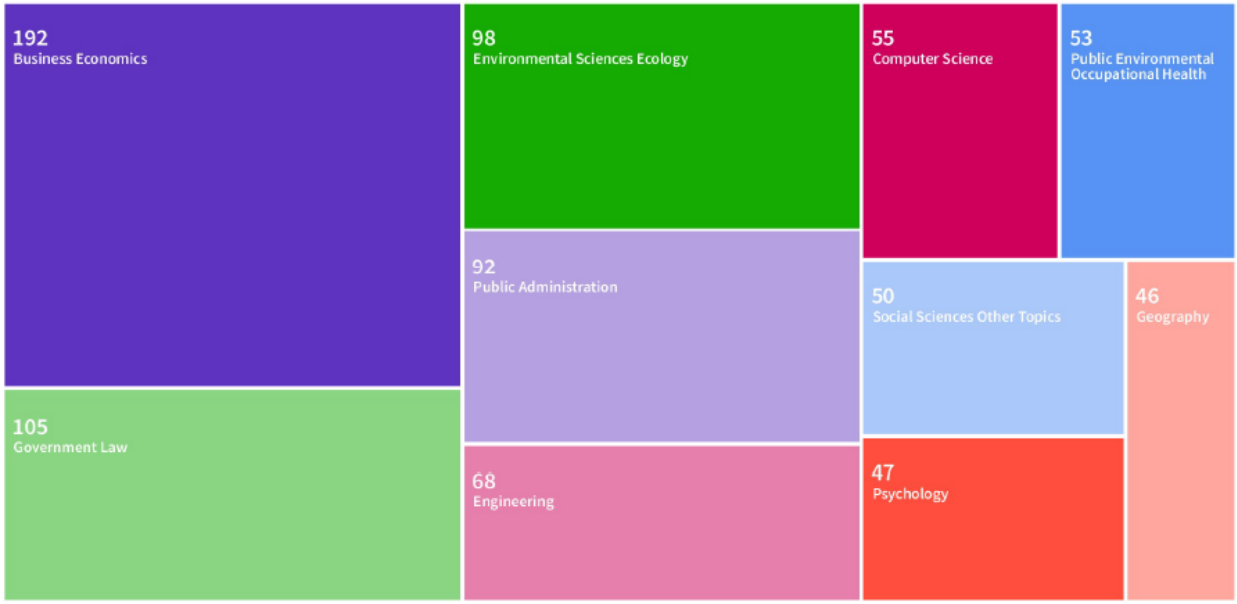
Influence in the Safety Discourse

To assess the influence of the book, the scientific database 'Web of Science' is used for a bibliometric analysis.

'Web of Science' identified a total of 483 references towards *Searching for Safety*. The citation reference search resulted in Figure 10. Only a limited number of references can be traced towards the safety discourse. It is concluded that the influence of the book is limited in the safety discourse with the exception of HRO where Wildavsky's bodies of ideas regarding resilience are recognized and utilised, and RE where it appears to be considered its genesis (Herrera, 2023).

Figure 10

Web of Science citation reference search results



Discussion

This chapter will deal with today's relevance of *Searching for Safety* and Wildavsky's view by assessing three societal risk debates. It will also elaborate on some of the critiques and conclusions of the research. The chapter will end with a suggestion of a better determination to apply anticipation and resilience and the continuation of the search.

Societal risk debates

Nuclear power

The relevance of Wildavsky's *Searching for Safety* is reflected in the outcome of a study by Neidell et al. who performed an empirical evaluation of unintended outcomes from invoking the precautionary principle after the Fukushima Daiichi nuclear accident in Japan in 2011 (Neidell et al., 2019).

After the accident, all Japanese Nuclear Power Plants (NPP) had to stop operation and nuclear power was replaced by fossil fuels, causing a substantial increase in electricity prices which led to a reduction in energy consumption. This caused an increase in mortality during very cold temperatures. It is estimated that the increase in mortality from the increased electricity prices has outnumbered the mortality from the accident itself. It appears that the decision to stop nuclear production has caused more deaths than the accident itself (Neidell et al., 2019).

The incident also forced the shutdown of the German nuclear reactors. A team of economists have estimated that the costs of the nuclear phase-out and shift to coal has led to a social cost of 12 billion dollars per year and an increase of more than 1,000 extra deaths due to pollution (Winters, 2023.). These examples show that Wildavsky's argument of consideration of net benefit being the differentiator in risk assessments is alive and well (Wildavsky (1988a, p. 207). Wildavsky would have referred to the opportunity benefits versus opportunity costs. By eliminating the risks, even greater health benefits may be eliminated (Wildavsky, 1988a, p. 40). These could be lower energy prices thus improving living standards for poorer people as well as lower costs on food. The closure of the NPPs caused an adverse effect on both, hereby decreasing societal safety.

Since the publication of *Searching for Safety*, the nuclear debate has not changed much regarding the perceived risks. The incidents at TMI, Chernobyl and Fukushima Daiichi constructed the belief that reactors are dangerous. The main environmental hazard of NPPs is attributed to the possibility of accidents because of their catastrophic potential. Although the probability of such accidents at modern NPPs is low, it is indeed not zero. However, despite these dangers with radiation, during the 50 years in which atomic energy has been developed on earth, fewer people have died from radiation than those who die in daily car accidents (Basu & Miroshnik, 2019, p. 8). Basu & Miroshnik (2019, p. 8) state that the probability of dying as a result of an accident in the nuclear industry is 100 times lower than in a car accident and 1000 times smaller than from heart disease. They argue that, compared with the harmful effects of other technologies on the overall risk to human life and nature generally, NPPs are the safest of all. The CT approach on risk perception, as explained by Douglas and Wildavsky (1982, p. 20), therefore remains relevant.

Pesticides

Another debate is the use of Glyphosate, the most widely used pesticide in the world. There are clear indications that exposure to it causes ALS,[71] Parkinson's and Alzheimer disease. It is 'probably carcinogenic to humans' as claimed by the IARC.[72] Nonetheless, the EU commission has voted for an extension in use for another ten years despite the known hazards to humans as well as to fauna (i.e., honeybees and bumblebees). One of the manufacturers has recently settled for about 10 billion dollars for 30,000 cases of ill people in US court. There is no clear consensus about the risks between the various stakeholders. The research used to derive to the current risk classification appears to be heavily influenced by the industry and limited in the assessed risks. However, scientists argue that a complete ban will not

[71] ALS, or Amyotrophic Lateral Sclerosis, is a progressive neurodegenerative disease that affects nerve cells in the brain and spinal cord (What Is ALS?, n.d.).

[72] International Agency for Research on Cancer. This is an expert panel of the World Health Organization https://www.iarc.who.int/).

make the use of Glyphosate any safer since there are limited alternatives available which can be averse to the environment as well. They argue that one can put limits to the use of the pesticide in the short term. Nonetheless, individual EU countries have put anticipatory policies in place by banning the product (e.g., Austria). (IARC Monograph on Glyphosate, n.d.; BNNVARA, n.d.; Vanoost, n.d.).

PFAS

PFAS, referred to as the 'Forever Chemicals,' are considered to be one of the largest threats to the environment and human health (Pensyl, 2023, p. 37; Lim, 2023, p. 24). PFAS consist of about 12,000 different substances which can be divided in 3 distinct forms: 1) The notoriously toxic kinds, the fluor surfactants,[73] 2) The fluoropolymers (the plastic-like form that most people encounter),[74] and 3) The category of PFAS which are made up of gases or liquids.[75]

PFAS are distributed into the environment through products, exposure, and consumption (Pensyl, 2023, p. 42), and are all around us "since because they exist, every piece of equipment that's followed a capital process, trying to get faster, quicker, more efficient, has adopted fluorinated materials" (Lim, 2023, p. 27). PFAS is extremely useful but cannot be broken apart by natural processes. Although several PFAS cause severe adverse health effects and are banned under (inter)national legislation, still there are many PFAS left that have had no toxicological assessment or are not linked to adverse health effects. The challenge with PFAS is thus that some kill while others are safe enough to be used in medicines (Lim, 2023, pp. 24, 25). For instance, fluor surfactants are linked to serious health harms and

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[73] These molecules resemble those in soap, made of two parts: carbon chains with fluorine atoms wrapped around them, that repel everything, and a water-loving portion at one end of the chains that allows the molecules to dissolve in water (Lim, 2023).

[74] The most famous example is Teflon, or polytetrafluoroethylene (PTFE), long carbon chains wrapped in fluorine atoms (Lim, 2023).

[75] This are small, light fluorocarbon molecules that generally exist as gases or liquids. For instance, R134a, the asthma-inhaler propellant, is also a common refrigerant in refrigerators and mobile air-conditioning systems (Lim, 2023).

widespread water pollution. Manufacturers have therefore moved to alternatives which do lack toxicological studies, like GenX chemicals (Lim, 2023, p. 25; Pensyl, 2023, pp. 50, 51). Another challenge is that there are no proper replacements of the various PFAS used. It is expected that for the replacement of PTFE alone, already dozens of replacements are required with limited properties hence also limited in use.

Lim's article claims that PFASs are a block to innovation. There is a need for replacement materials that have to be fluorine free, but these have not been invented since funding goes to cleaning PFAS contaminated locations. The EU Chemicals Agency (ECHA) has proposed legislation that will restrict the manufacture of PFAS. This legislation will be in force after a techno-economic assessment that will evaluate the costs and benefits for society (Lim, 2023, p. 27). However, there are also others who point out that the doses used are not representative at all and that the quality of research is doubtful (Wentzel, 2023).

The relevance of Wildavsky arguments becomes visible with the above examples of Glyphosate and PFAS. The use of untested substances to replace the existing pesticide or PFAS refers back to lessons learned of Wildavsky who argues that we learn from a substance in use. He explains that continuity is likely to be safer as we likely to know more about the existing substance (since it has been tried) than we do about its replacement (Wildavsky, 1988a, pp. 196, 197). Wildavsky may have a point here since the untested substances may turn out to be more adverse than the current ones. Further relevance is found in the fact that market competition is found to be a blocker instead of a promoter of invention (Wildavsky, 1988a, p. 75), it appears to be the contrary: Because of anticipatory measures, invention is promoted to come up with alternatives. Both debates show the influence of industry on legislation as identified by Wildavsky, Beck and Perrow (See chapter 'Societal Risk'). Furthermore, Wildavsky's earlier mentioned arguments about net benefit remain relevant (Wildavsky, 1988a, p. 207), as well as the discussion about doses (Wildavsky, 1996). The search for alternatives would Wildavsky (1988a, p. 227) considered to be searching for safety.

The introduction of drugs and medicines

Further relevance is found in the recent COVID-19 pandemic, which may be considered as a qualitative surprise (Wildavsky, 1988a, p. 93). Governments had to step in and come up with strategies to battle the virus. To do this, governments had to intervene with various measures including newly developed drugs and medicines which were implemented in various countries with various degrees of success. As Jennings (2021, p. 1175) explains, a crisis is characterized by threat, uncertainty and the need for urgent action exerts a strain on trust. Trust can be considered as a family with three members: 1) Trust, 2) Mistrust, and 3) Distrust. These three shape citizens perceptions and behaviours (Table 10) (Jennings, 2021, p. 1175).

Table 10

The Political trust family (Jennings, 2021, p. 1177).

Trust types	Orientation	Associated attitudes	Behavioural consequences
Trust	Trust expressed towards the political system in its entirety or its components	Loyalty, commitment, confidence	Compliance, sympathetic judgement, participation
Distrust	Distrust expressed towards the political system in its entirety or its components	Insecurity, cynicism, contempt, fear, anger, alienation	Withdrawal, defiance, support for populist challenge or empowerment movement
Mistrust	Political mistrust expressed through vigilance in judging components of the political system	Caution, watchful, questioning	Making effort to be informed, alert, on standby to act

Jennings (2021, p. 1179) points out that crises, especially pandemics such as COVID-19, also demand behavioural adjustments by citizens. They are expected to change significant parts of their everyday lives, in this case to follow public health guidelines and restrictions designed to limit the spread of the virus. The response of citizens is thus integral to how societies and governments respond to the crisis. Trusted citizens are less likely to adjust their behaviour like distrusted citizens. However, the latter also reject the severity of the pandemic and the advice of scientific experts and government which trusted citizens do not. The mistrusted citizens, the ones that are cautious and informed, are more likely to adjust their behaviour towards public health guidelines and restrictions based on the actual facts (i.e., Wildavksy's informed Citizen) (Wildavsky, 1997).

Trust must be linked to trustworthiness, says O'Neill (2018, p. 2), she points out that "we live in a post factual or post truth era and in disputes about who is peddling not merely the occasional

misinformation, exaggeration or lie, but pervasive fake news and all too often promoting combative and dismissive views of supposed expertise, including scientific and professional expertise." Therefore, she argues, "we need to think carefully and critically about claims to expertise and about trust in experts." The mistrusted citizen is supported by her. Wildavsky believed that when being a citizen in a scientific and technology age, the citizen has to make informed decisions about the environmental and safety risks one is confronted with (Wildavsky, 1997, pp. 1, 2). The relevance of Wildavsky's belief is only enlarged in this post factual era.

Critiques and context

A part being stronger than the whole

Wildavsky depicts a rosy view about market competition increasing safety in which it appears that he forgot his own 'Axiom of Connectedness:' "Safety and harm are intertwined in the same acts and objects." (Wildavsky, 1988a, p. 4). The pressures from market competition can thus also result in organizational deviance[76] (Vaughan, 1999, p. 273). It is further argued by Vaughan, hereby quoting work from Marcus et al., that "competition and scarcity set the stage for accidents when they lead to cost/safety trade-offs" (Vaughan, 1999, p. 293). The same argumentation Roth used when describing the effects of the deregulation of the truck drivers in the USA (See appendix D). The earlier examples of Glyphosate and PFAS also show that the good and the bad are intertwined in market competition.

Wildavsky would point out "that there is no free lunch, no doctrine is invulnerable under all conditions" (Wildavsky, 1979b, p. 158). Further he would explain, the failure of the market is that it only embraces efficiency and neglects other issues like distribution of income: "Economic rationality does not always know best" (Wildavsky, 1979b, p. 173). If markets were perfect, Wildavsky would argue, there

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[76] Organizational deviance is "an event, activity, or circumstance, occurring in and/or produced by a formal organization, that deviates from both formal design goals and normative standards or expectations, either in the fact of its occurrence or in its consequences, and produces a suboptimal outcome." This outcome may range from a mistake up to a disaster (Vaughan, 1999, p. 273).

would be no need for governmental intervention (Wildavsky, 1979b, p. 5). With regards to the deregulation policy, Wildavsky would argue that policies should not be considered being eternal truths but as hypotheses subject to change and disposed in favour of better ones until these are disposed as well (Wildavsky, 1979b, p. 16).

The role of political science in the safety discourse

How safe is safe enough has only a social or political answer, reflected in regulatory, legal or community tolerances (Shulman, 2004, p. ii39). This is acknowledged by Wildavsky who argues that since perception is what is safe and what is dangerous implies judgements about the societal institutions that produce these good and bad, thus perception is partly a political act (Wildavsky, 1988a, p. 205). To understand this, political science is utilised. Political science may be considered to be the Cinderella of the safety discourse. As identified earlier, political science studies 'politics:' the constrained use of social power (Goodin & Klingemann, 1996 p. 7). As remarked by Dekker & Nyce (2013, p. 44), "Safety science has not worried much about power at all." Whereas they envision the use of power being reflected in the power to speak up or to have the power to speak up to say what happened in a particular event, it is not the macro political power that can be utilized on micro level based on the body of knowledge of political science. As Dekker & Nyce indicate, "there are a number of means in which social power can be more firmly integrated into the safety discourse" (Dekker & Nyce, 2013, p. 49).

Therefore, it would be wise for the safety discourse to include political science. Organisational deviance is a clear example of organizational power (Vaughan, 1999). Perrow concurs: "We miss a great deal when we substitute power with culture". With this he refers to the Challenger launch decision[77] where he disagrees with Vaughan's conclusion of 'Normalisation of Deviance' being a part of NASA's culture, by stating that it was clearly the use of organisational power that resulted in the fatal launch decision (Perrow, 1999, p. 380).

[77] The launch of Space Shuttle Challenger resulted in a fatal explosion on January 28, 1986 (Vaughan, 1996).

This launch decision is also the main example of a book and article by Antonsen dealing with the lack of power in safety culture.[78] He questions how shared a safety culture actually is considering the role of conflict and power therein, hereby confirming Perrow's critique. (Antonsen, 2009 p. 184; Antonsen, 2017). He argues that risk is socially constructed, and power influences the definition of risk, hereby reflecting on Douglas & Wildavsky (1982) and Beck (1992). He is in favour of a power-oriented view on safety culture hereby making way for an analytical study of the underpinning theoretical and practical expectations of the concept of safety culture to prevent controlling safety regimes (e.g., BBS based brainwash) and to pursue the concept of safety culture in a scientific manner (Antonsen, 2009, pp. 189, 190; Antonsen, 2017). A view which is also maintained by Silbey (2009, p. 341), who argues that "inequalities in power and authority as being features of complex systems should be researched to understand safety culture". Perhaps an adaption of Douglas & Wildavsky's CT could be of benefit here, for is it not argued that an organisation is a reflection of society?

The application of anticipatory and resilience strategies

Wildavsky (1988a, p. 93) concludes that the environmental conditions under which anticipation or resilience are more or less appropriate strategies, are based on knowledge of what to do about dangers, and the predictability of change. So, if knowledge is large and predictability high: anticipation should rule. If knowledge is small and predictability low: resilience should rule. In case of the two other possibilities, it should be a mix of both where, based on the amount of knowledge or predictability, one or the other is the leading strategy. Wildavsky argues for roughly one-third anticipation (when we know what we are doing) and two-thirds of resilience (because we most often do not), in order to accumulate general resources to devote to alleviating harm when it emerges (Wildavsky 1989b, pp. 30-31).

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[78] Antonsen (2009, p. 184) uses the ACSNI definition for safety culture: "(…) the product of individual and group values, attitudes, perceptions, competencies, and patterns of behaviour that determine the commitment to, and the style and proficiency of, an organisation's health and safety management.

This view is maintained by other parties as well. Pariès (2022, pp. 107, 108) argues that the current societal strategy is still largely perceived as anticipation being the capacity to anticipate all situations hereby determining the right technical and human solutions and to ensure conformity with what was anticipated. He points out that the recent COVID-19 Pandemic has learned that "the only certainty is uncertainty," the unexpected and unpredictable will happen (Wildavsky's qualitative surprise). However, as Pariès points out, the current safety 'paradigm' is still based upon anticipation and predetermination.

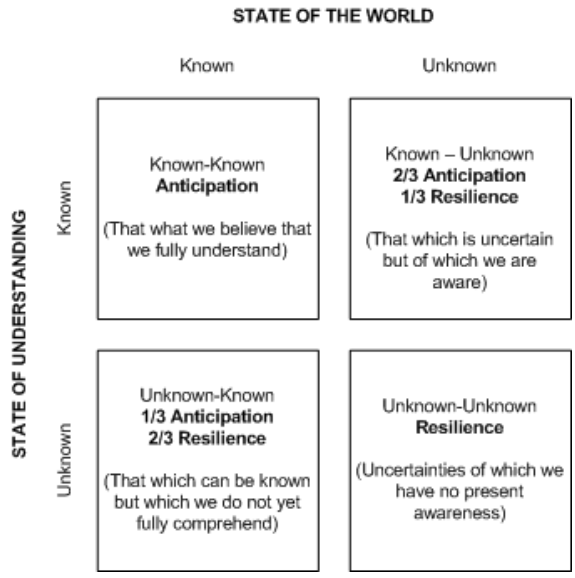
Hancock, proposes on a micro level a framework that includes four quadrants that describe circumstances that any response system is generally required to deal with in order to ensure safe, and reasonably efficient operations (Figure 10). With this, he explores the opportunities to match the nature of problems expressed in these four resultant quadrants to differing forms of decision-making styles. For the Unknown-Unknowns (Wildavsky's qualitative surprise and Hancock's blue swan), Hancock envisages resilience as promoted by RE[79] (Hancock, 2023, p. 455).

By placing Hancock's taxonomy in the macro–safety discourse, and by adding the various anticipation-resilience strategies, it will provide a means to identify how to establish the right mix of strategy to include in public policy to ward of harm (Figure 11).

[79] "The capacity to change in response to conditions that push a system beyond the boundaries of its effective stability and to establish a new, normal state of operations beyond the initial operating parameters" (Hancock, 2023, p. 455).

Figure 11

Hancock's taxonomic representation combined with Wildavsky's Anticipation-Resilience strategy.



Wildavsky what could 'have been'

When Wildavsky passed away on the 4th of September 1993 (Jones & McCaffery, 1994), he had almost finalised his third book related to EHS risks (Wildavsky, 1997). One may consider the books *Risk and Culture* (Subjective risk), *Searching for Safety* (Objective risk), and *But is it true – A Citizen's guide to Environmental Health and Safety Issues* (Determining the factual EHS risks) being a trilogy.

This trilogy remains as relevant today as when it was written, with the various examples in this thesis as proof of that. However, what is not clear form this trilogy is how to get society along to comply with the resilient strategies applied when dealing with societal surprises. As Douglas and Wildavsky (1982, p. 198) identified, the focus needs to be on resilient institutions that support society, rather than on the debate of risk. They further point out that choosing resilience depends on some degree of trust in these institutions. Wildavsky's posthumous published book dealt with the critical citizen who might now be labelled as mistrustful (Wildavsky, 1997; Jennings, 2021). How this citizen should than trust these resilient institutes would have been a good topic for Wildavsky to elaborate further on. Obviously, this is not possible anymore, so it is left to the safety discourse to take up this gauntlet. The 'faster, cheaper and better' approach related to capitalist market competition, the 'Axiom of Connectedness' of the market

competition, the paradox that anticipation instigates innovation, and last but not least, the changes in neo-conservatism and neo-liberalism are of great interest for further research as well.

The search continues

The neo-liberal order and the Great Recession and the Great Pandemic have resulted in a diminishing trust in democratic institutions, the global market economy, and political and economic elites, in the US and Europe. This has shown itself in protectionism, hostility toward immigration, and a growing leaning toward authoritarian populism. It further shows that neo-liberalism passed its expiry date which has resulted in a considerable divide in the distribution of wealth (and risk) (Gerstle, 2022, pp. 297-298; Wolfe, 2023, p. xviii). Many alarms have already been raised regarding humanity having reached the safe limits to growth in terms of anthropocene risks which by many are considered to be existential risks (Peck, 2013; Le Coze, 2023). It is therefore argued to decouple growth from carbon emissions, hence, to steer away from Democratic Capitalism: A dematerialized economy is needed. To ensure the accumulation of wealth and innovation, a form of market competition is still required. An alternative to the current 'Democratic Capitalism' might be 'Economic Democracy.' [80]

This alternative still makes it possible to have market competition, entrepreneurship and accumulation of wealth to ensure a growth of general resources to be able to be resilient (Wildavsky, 1988a, p. 74). Although one may (dis) agree with Economic Democracy, one has to agree that the theory has included the lessons learned from its predecessors' 'Socialism' and 'Capitalism.' It may even be considered to be a macro resilience strategy to ward off Anthropocene risks. Wildavsky would probably

[80] It is a democratic order that "Would decentralize many significant decisions among relatively autonomous economic enterprises, which would operate within limits set by a system of markets, and such democratically imposed laws, rules, and regulations as we may believe are necessary to achieve our goals. Such decentralization would require that significant authority to make important decisions be exercised within firms. These firms are a system of economic enterprises collectively owned and democratically governed by all the people who work in them" (Dahl, 1985, p. 91).

concur,[81] since his answer for society is to remain resilient, by not tolerating known and avoidable sorts of failure, but through economic growth and technical progress. Because of this, society learns to cope better with adversity, thus becoming more resilient.

[81] "Instead of focusing all our attention on risk, effort should also be devoted to understanding how and why we have become safer than our predecessors. Instead of assuming that risk may be reduced only by direct action, we should consider whether indirect action stemming from economic growth may not be more efficacious. What would a 1-3 percent increase in economic growth do for life expectancy and accident prevention as compared with the safety measures now contemplated" (Wildavsky, 1981, p. 38)?

"If the safety movement is about survival, increasing and improving a general capacity – Human intelligence, scientific knowledge, technical abilities, diversity of experience – to respond resiliently best aims at that result. There may be a better single measure of this capacity than economic growth, but if so, I am not aware of it" (Wildavsky, 1981, p. 38).

Conclusion

The relevance and influence of Searching for Safety in today's safety discourse

Since the safety discourse mainly focusses on the micro-level (the actual work executed on an organization level), it is concluded that *Searching for Safety*, even though Wildavsky may be seen as the linking pin between RE, HRO and NAT, has a limited influence and relevance in today's safety discourse.

However, the safety discourse may still benefit from Wildavsky's work in political science, such as the dealing with social power within organizations, e.g., the politics in budgeting, the implementation of policies, CT, radical egalitarianism, the critical citizen, and resilience versus anticipation strategies. Last but not least, net benefit may be the way forward in determining the economics of safety hereby providing better answers to the distribution question by using opportunity costs versus opportunity benefits in risk assessments. It may be of use as well in the imminent societal changes. The safety discourse needs to adapt politics to become at par with the circles of influence where global risks and societal changes are discussed to be able to address Global Safety. Wildavsky's legacy may be of use here as well.

As identified, within RE a focus emerges towards global risks, although with a catastrophist view by adopting Perrow's NAT in the Global Safety debate as a way forward (Le Coze, 2023; Pariès, 2022, p. 109). A Cornucopian view and resilience strategy as provided by Wildavsky is of the essence to provide counterweight to the current macro RE view in the Global Safety debate.

Considering the ongoing application of the precautionary principle and the demise of neo-liberalism and neo-conservatism, the current societal / global risks and imminent societal changes, the key message of *Searching for Safety* is still, and has even become more, relevant 45 years after publication of the book in this modern Western society.

Wildavsky' view that the mechanism of market competition is the means forward to progress in wealth and knowledge remains valid as well. Despite his neo-conservatism, Wildavsky validated market competition by considering the last two centuries, which have witnessed the coming and going of many policies and ideologies, however, market competition still strives. Clearly, neo-liberalism had its time. Hopefully, other democratic alternatives, which include a form of market competition that enables

progress, will replace it soon. This to ensure the accumulation of wealth in money and knowledge to be able to be resilient,[82] "since the safety we seek is bound up in the danger that accompanies it:" Global Safety vs. Global Risks (Wildavsky, 1988a, p. 207).

Despite being Cornucopian, Wildavsky is well aware that technology is not the Holy Grail: It can damage as well as improve matters. The kind of safety as is dealt with in *Searching for Safety*, is about "the damage versus the improvement to individual health stemming from technology," as he explains, "This kind of safety may be achieved at the expense of other values and therefore other senses of safety people hold dear" (Wildavsky, 1988a, pp. 212, 213). Values like liberty, and security may be jeopardised. He warns that wealth related to the human health may have devastating effects on these other values, since "health is not heaven and there may be many 'safe' ways to a variety of hells" (Wildavsky, 1988a, p. 212). "Since there is always room for improvement, it is crucial to discover better combinations" (Wildavsky, 1988a, p. 227).

Safety is thus clearly a process of discovery. Therefore, searching for safety has to continue by including risk taking in public policy to be able to find these better combinations by means of net benefit. Hereby applying the proposed anticipation-resilience strategies, with the glass half full, not only to be resilient as society against the black and blue swans, but also as a means to deal with the imminent societal changes.

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[82] "The importance for safety of convertible resources gives a new dimension to processes that create and expand wealth: these aid in the search for safety by maintaining a redundancy of means and a varied repertoire of responses to unpleasant surprises" (Wildavsky, 1988a, p. 216).

References

A. Almond, G. (1998). The History of the Discipline. In *A New Handbook of Political Science*. Oxford University Press.

About The MPS - *The Mont Pelerin Society*. (n.d.). https://www.montpelerin.org/event/429dba23-fc64-4838-aea3-b847011022a4/websitePage:d0c34bd9-1aa4-48df-a55e-4be50dfb57ee

Adams, J. (1995). *Risk*. Psychology Press.

Antonsen, S. (2009). Safety culture and the issue of power. Safety *Science, 47*(2), 183–191. https://doi.org/10.1016/j.ssci.2008.02.004

Antonsen, S. (2017). *Safety culture: Theory, Method and Improvement*. CRC Press.

Aven, T. (2014). What is safety science? *Safety Science, 67*, 15–20. https://doi.org/10.1016/j.ssci.2013.07.026

Balla, S. J., Lodge, M., & Page, E. (2015). *The Oxford Handbook of Classics in Public Policy and Administration*. Oxford Handbooks.

Basu, D., & Miroshnik, V. (2019). Advantages of Nuclear Power. *The Political Economy of Nuclear Energy, 8*. https://doi.org/10.1007/978-3-030-27029-2_2

Beck, U. (1992). *Risk Society: Towards a New Modernity* (Published in association with Theory, Culture & Society) (1st ed.). SAGE Publications Ltd.

Beck, U. (2009). *World at risk*. Polity.

Bergström, J., & Dekker, S. W. A. (2014). Bridging the Macro and the Micro by Considering the Meso: Reflections on the Fractal Nature of Resilience. *Ecology and Society, 19*(4). https://doi.org/10.5751/es-06956-190422

Bergström, J. (2017). An archaeology of societal resilience. *Safety Science, 110*, 31–38. https://doi.org/10.1016/j.ssci.2017.09.013

Bergström, J., & Dekker, S. W. A. (2019). The 2010s and Onward Resilience Engineering. In *Foundations of Safety Science* (pp. 391–429). CRC Press.

Bergström, J., van Winsen, R., Henriqson, E., 2015. On the rationale of resilience in the domain of safety: a literature review. *Reliab. Eng. Syst. Saf. 141*, 131–141. http://dx.doi.org/10.1016/j.ress.2015.03.008.

Blaxter, L., Hughes, C., & Tight, M. (2010). *How To Research*. McGraw-Hill Education (UK).

Blinder, A. S. (1988). The fall and rise of Keynesian economics. *Economic Record, 64*(4), 278–294. https://doi.org/10.1111/j.1475-4932.1988.tb02067.x

Bowen, G. A. (2009). Document Analysis as a Qualitative Research Method. *Qualitative Research Journal, 9*(2), 27–40. https://doi.org/10.3316/qrj0902027

Bosso, C. J. (1989, September). Reviewed Work(s): In Search of Safety: Chemicals and Cancer Risk by John D. Graham,Laura C. Grew and Marc J. Roberts; Searching for Safety by Aaron Wildavsky. *The American Political Science Review, Vol. 83, No. 3*, 1017–1019. https://www.jstor.org/stable/1962089

Boyd, W. C. (2012). Genealogies of Risk: Searching for Safety, 1930s-1970s. *Ecology Law Quarterly, 39*(4), 895. https://doi.org/10.15779/z38qg3t

Bradbury, J. A. (1989). Book Review: Searching for Safety. *International Journal of Mass Emergencies & Disasters, 7*(2), 202–204. https://doi.org/10.1177/028072708900700 2

Braman, D., Gastil, J., Kahan, D. M., & Slovic, P. (2005). The "Wildavsky Heuristic": The Cultural Orientation of Mass Political Opinion. *Social Science Research Network*. https://doi.org/10.2139/ssrn.834264

Brown, W. (2006). American Nightmare. *Political Theory, 34*(6), 690–714. https://doi.org/10.1177/0090591706293016

Brumagen, R. (2013, November 13). Unsafe at any speed | Ralph Nader, Auto Safety & Consumer Rights. Encyclopaedia Britannica. https://www.britannica.com/topic/Unsafe-at-Any-Speed

Buchanan, J.M. (1991). Opportunity Cost. In: Eatwell, J., Milgate, M., Newman, P. (eds) *The World of Economics*. The New Palgrave. Palgrave Macmillan, London. https://doi.org/10.1007/978-1-349-21315-3_69

Byrne, J. H., & Martinez, C. (1989). Ghastly science. *Society, 27*(1), 22–24. https://doi.org/10.1007/bf02695450

Caiden, N. (1994). Foreword - Aaron Wildavsky. *Public Budgeting and Finance, Spring 1994*.

Cain, Á. (2022). Since 2020, there have been about 500 shootings at major supermarket chains in America, study finds. *Business Insider*. https://www.businessinsider.com/supermarket-shootings-america-statistics-grocery-store-guns-2022-6?international=true&r=US&IR=T

Caldwell, B. J. (n.d.). F.A. Hayek | Biography, Books, & Facts. *Encyclopaedia Britannica*. https://www.britannica.com/biography/F-A-Hayek

Campbell, A. (2005). The Birth of Neoliberalism in the United States: A Reorganisation of Capitalism. *Neoliberalism a Critical Reader*.

Carson, R. (2000). *Silent Spring*. Gardners Books.

Catton, W. R. (1989). Choosing which danger to risk. *Society, 27*(1), 6–8. https://doi.org/10.1007/bf02695443

Ceteris paribus. (2023). https://dictionary.cambridge.org/dictionary/english/ceteris-paribus

Chauncey Starr | Electrical, Computer, and Systems Engineering. (z.d.). *https://ecse.rpi.edu/*. https://ecse.rpi.edu/about/hall-of-fame/chauncey-starr

Chickering, A. (1993). Aaron Wildavsky, R.I.P. *National Review*, 18.

Chowdhury, M. F. (2014). Interpretivism in Aiding Our Understanding of the Contemporary Social World. *Open Journal of Philosophy, 04*(03), 432–438. https://doi.org/10.4236/ojpp.2014.43047

Clarke, J. N., & Ingram, H. M. (2010). A Founder: Aaron Wildavsky and the Study of Public Policy. *Policy Studies Journal, 38*(3), 565–579. https://doi.org/10.1111/j.1541-0072.2010.00374.x

Clarke, L. (1989). Capitalism is richer, democracy is safer. *Society, 27*(1), 17–18. https://doi.org/10.1007/bf02695448

Collard, D. (1989). Searching for Safety by Aaron Wildavsky. *Journal of Public Policy, 9*(1), 114–115. https://www.jstor.org/stable/4007223

contemporarythinkers.org. (2015, June 12). *Aaron Wildavsky - Biography*. Contemporarythinkers.org. Retrieved January 21, 2023, from https://contemporarythinkers.org/aaron-wildavsky/biography/

Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. SAGE Publications Limited.

Crotty, M. (1998). *The Foundations of Social Research: Meaning and Perspective in the Research Process*. SAGE Publications Limited.

Cydni. (2019). Tort Law - Definition, Examples, Cases, Processes. *Legal Dictionary*. https://legaldictionary.net/tort-law/

Dahl, R. A. (1985). *A Preface to Economic Democracy*. University of California Press.

Dahl, R. A. (2007). The concept of power. *Behavioral Science, 2*(3), 201–215. https://doi.org/10.1002/bs.3830020303

Dake, K. (1991). Orienting Dispositions in the Perception of Risk. *Journal of Cross-Cultural Psychology, 22*(1), 61–82. https://doi.org/10.1177/0022022191221006

De toekomst van de omstreden onkruidverdelger glyfosaat in Europa - Zembla - BNNVARA. (n.d.). *Zembla*. https://www.bnnvara.nl/zembla/artikelen/de-toekomst-van-de-omstreden-onkruidverdelger-glyfosaat-in-europa

Definition of res ipsa loquitur. (n.d.). In *Merriam-Webster Dictionary*. https://www.merriam-webster.com/legal/res%20ipsa%20loquitur

Dekker, S. (2014). *Safety differently: Human Factors for a New Era, Second Edition*. CRC Press.

Dekker, S. (2019). *Foundations of Safety Science: A Century of Understanding Accidents and Disasters*. Routledge.

Dekker, S., & Nyce, J. M. (2013). There is safety in power, or power in safety. *Safety Science, 67*, 44–49. https://doi.org/10.1016/j.ssci.2013.10.013

Dold, M., & Krieger, T. (2021). The ideological use and abuse of Freiburg's ordoliberalism. *Public Choice, 195*(3–4), 341–361. https://doi.org/10.1007/s11127-021-00875-0

Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research, 133*, 285–296. https://doi.org/10.1016/j.jbusres.2021.04.070

Dorfman, M. S. (1990). Searching for Safety by Aaron Wildavsky. *The Journal of Risk and Insurance, 57*(3), 564–565. https://www.jstor.org/stable/252851

Douglas, M. (2003). *Natural Symbols: Explorations in Cosmology* (3rd ed.). Routledge.

Douglas, M. (2007). *A history of grid and group cultural theory*. University of Toronto, Toronto, Canada.

Douglas, M., & Wildavsky, A. B. (1982). *Risk and Culture: An Essay on the Selection of Technical and Environmental Dangers*. University of California press

Drisko, J., & Maschi, T. (2015). *Content Analysis (Pocket Guides to Social Work Research Methods)* (Illustrated). Oxford University Press.

Ehrlich, P. R., & Ehrlich, A. H. (1989). Intelligent planning for safety. *Society, 27*(1), 15–16. https://doi.org/10.1007/bf02695447

Elazar, D. J. (1994). IN MEMORIAM: AARON WILDAVSKY (1930–1993). *Publius*. https://doi.org/10.1093/oxfordjournals.pubjof.a038125

Epstein, C. (2016). Precautionary principle | Environmental Protection, Risk Management & Sustainability. *Encyclopaedia Britannica*. https://www.britannica.com/topic/precautionary-principle

Fardon, R. (1999). *Mary Douglas: An Intellectual Biography*. Routledge.

Gaskins, R. (1989). Extending the search for safety. *Society, 27*(1), 19–21. https://doi.org/10.1007/bf02695449

Gephart, R. P. (1984). Making Sense of Organizationally Based Environmental Disasters. *Journal of Management, 10*(2), 205–225. https://doi.org/10.1177/014920638401000205

Gerstle. (2023). *The rise and fall of the neoliberal order*. Oxford University Press, USA.

Goldman School of Public Policy. (n.d.-a). *Aaron Wildavsky*. gspp.berkeley.edu. https://gspp.berkeley.edu/about/history/aaron-wildavsky

Goldman School of Public Policy. (n.d.-b). *Aaron Wildavsky | History | About GSPP | Goldman School of Public Policy | University of California, Berkeley*. Retrieved January 21, 2023, from https://gspp.berkeley.edu/about/history/aaron-wildavsky

Goldstein, A. M. (2017). *Janesville: An American Story*. Simon & Schuster Inc.

Goodin, R. E. (1980). No Moral Nukes. *Ethics, 90*(3), 417–449. https://doi.org/10.1086/292171

Goodin, R. E. (2011). The State of the Discipline, the Discipline of the State. In *Oxford University Press eBooks*. https://doi.org/10.1093/oxfordhb/9780199604456.013.0001

Goodin, R. E., & Klingemann, H. (1998). *A New Handbook of Political Science*. Oxford University Press on Demand.

Haavik, T. K., Antonsen, S., Rosness, R., & Hale, A. (2019). HRO and RE: A pragmatic perspective. Safety Science, 117, 479–489. https://doi.org/10.1016/j.ssci.2016.08.010

Hale, A. (2014). Foundations of safety science: A postscript. *Safety Science, 67*, 64–69. https://doi.org/10.1016/j.ssci.2014.03.001

Hancock, P. A. (2023). Reacting and responding to rare, uncertain and unprecedented events. *Ergonomics, 66*(4), 454–478. https://doi.org/10.1080/00140139.2022.2095443

Hanel, R., Thurner, S., & Klimek, P. (2018). Introduction to the Theory of Complex Systems. *In Oxford University Press eBooks*. https://doi.org/10.1093/oso/9780198821939.001.0001

Harvey, D. (2007). *A brief history of Neoliberalism*. Oxford University Press, USA.

Hayes, B. K., Heit, E., & Swendsen, H. (2010). Inductive reasoning. *Wiley Interdisciplinary Reviews: Cognitive Science, 1*(2), 278–292. https://doi.org/10.1002/wcs.44

Heinrich, H.W. (1941) *Industrial Accident Prevention (second edition)*. New York: McGraw-Hill.

Herrera, I. (2023). REA Webinar - A view into the 10th Symposium on Resilience Engineering. In *Resilience Engineering Association* [Introduction of the REA]. REA Webinar.

Holling, C. S. (1973). Resilience and Stability of Ecological Systems. *Annual Review of Ecology and Systematics, 4*(1), 1–23. https://doi.org/10.1146/annurev.es.04.110173.000245

Hollnagel, E., Woods, D. D., & Leveson, N. (2006). *Resilience Engineering: Concepts and Precepts*. Ashgate.

Hollnagel, E. (2014). Is safety a subject for science? *Safety Science, 67*, 21–24. https://doi.org/10.1016/j.ssci.2013.07.025

Hollnagel, E. (2014). *Safety-I and Safety–II: The Past and Future of Safety Management*. Ashgate Publishing, Ltd.

Hopkins, A. (2014). Issues in safety science. *Safety Science, 67*, 6–14. https://doi.org/10.1016/j.ssci.2013.01.007

Hooley, T., Wellens, J., & Marriott, J. (2011). *What is Online Research?: Using the Internet for Social Science Research (The "What is?" Research Methods Series)* (Illustrated). Bloomsbury Academic.

Horowitz, I. L. (2004). Aaron Wildavsky: Facts, Policies, Morals. Modern Age, *Winter / Spring 2004*, 98–104. https://doi.org/10.4324/9781351323123-49

Huber, P. (1983). Exorcists vs. Gatekeepers in Risk Regulation. *AEI Journal on Government and Society, November–December, 23–32*.

IARC Monograph on Glyphosate. (n.d.). https://www.iarc.who.int/featured-news/media-centre-iarc-news-glyphosate/

Inman, M. (2016, May 23). *Hindsight bias | Definition, Psychology, & Examples*. Encyclopaedia Britannica. https://www.britannica.com/topic/hindsight-bias

International Relations | Political Science. (n.d.). https://polisci.columbia.edu/content/international-relations

Jacobson, G. C. (2017). The triumph of polarized partisanship in 2016: Donald Trump's improbable victory. *Political Science Quarterly, 132*(1), 9–41. https://doi.org/10.1002/polq.12572

Jasanoff, S. (1986). *Risk management and political culture*. Russell Sage Foundation.

Jasper, H. N. (1989). Safety in a Technological Society. *Public Administration Review, January/ February*.

Jennings, W. (2021). How trust, mistrust and distrust shape the governance of the COVID-19 crisis. *Journal of European Public Policy, 28*(8), 1174–1196. https://doi.org/10.1080/13501763.2021.1942151

Johnson-Laird, P. N. (2009). Deductive reasoning. *Wiley Interdisciplinary Reviews: Cognitive Science, 1*(1), 8–17. https://doi.org/10.1002/wcs.20

Jones, L. R. (1995). Aaron Wildavsky: A Man and Scholar for All Seasons. *Public Administration Review, 55*(1), 3. https://doi.org/10.2307/976823

Jones, L. R., & McCaffery, J. L. (1994). Aaron Wildavsky, Incrementalism, and Defense Budgeting. In *Defense Technical Information Center* (NPS-AS-94-002). Naval Postgraduate School Montery, California. Retrieved January 22, 2023, from https://apps.dtic.mil/sti/citations/ADA278625

Joseph, J. (2013). Resilience as embedded Neoliberalism: a governmentality approach. *Resilience, 1*(1), 38–52. https://doi.org/10.1080/21693293.2013.765741

Klein, B. H. (1980). The Role of Feedback in a Dynamically Stable Economic System. In *Social Science Working Paper 305*. California Institute of Technology.

Knoepfel, P., Larrue, C., Varone, F., & Hill, M. D. (2011). Public policy. In *Policy Press eBooks* (pp. 20–37). https://doi.org/10.1332/policypress/9781861349071.003.0002

Kristol, I. (2005). Forty good years. *The Public Interest, 159*.

Le Coze, J. C. (2019a). *Safety Science Research: Evolution, Challenges and New Directions*. CRC Press.

Le Coze, J. C. (2019b). Vive la diversité! High Reliability Organisation (HRO) and Resilience Engineering (RE). *Safety Science, 117*, 469–478. https://doi.org/10.1016/j.ssci.2016.04.006

Le Coze, J. C. (2022). The 'new view' of human error. Origins, ambiguities, successes and critiques. *Safety Science, 154*, 105853. https://doi.org/10.1016/j.ssci.2022.105853

Le Coze, J. C. (2023). Coupling and complexity at the global scale: flows, networks, interconnectedness and synchronicity (e.g. Covid-19). *Safety Science, 165*, 106193. https://doi.org/10.1016/j.ssci.2023.106193

Le Coze, J. C., Pettersen, K., & Reiman, T. (2014). The foundations of safety science. *Safety Science, 67*, 1–5. https://doi.org/10.1016/j.ssci.2014.03.002

Libertarianism.org. (1987, January 11). *Risk and Liberty* [Video]. Libertarianism.org. Retrieved January 21, 2023, from https://www.libertarianism.org/search/author/1641/category/video

Lim, X. (2023). Can The World Leave 'Forever Chemicals' Behind? *Nature, 620*, 24–27.

Lipscomb, M. (2012). Abductive reasoning and qualitative research. *Nursing Philosophy, 13*(4), 244–256. https://doi.org/10.1111/j.1466-769x.2011.00532.x

Lockhart, C., & M. Coughlin, R. (1998). Foreword. In *Culture and Social Theory* (ix-xxiii). Transaction Publishers

Love Canal: A Brief History. (z.d.). *SUNY Geneseo*. Geraadpleegd op 22 juli 2023, van https://www.geneseo.edu/history/love_canal_history

M. Judkins, B. (1988). Searching for Safety. by Aaron Wildavsky. *Contemporary Sociology, 17*(5), 663–664. https://www.jstor.org/stable/2073994

Mackuen, M. B., & Brown, C. (1987). Political Context and Attitude Change. *American Political Science Review, 81*(2), 471–490. https://doi.org/10.2307/1961962

Major, C. H., & Savin-Baden, M. (2012). *An Introduction to Qualitative Research Synthesis.*

Martin-Breen, P., & Anderies, J. M. (2011). Resilience: A Literature Review. *The Bellagio Initiative.* https://opendocs.ids.ac.uk/opendocs/bitstream/123456789/3692/1/Bellagio-Rockefeller%20bp.pdf

Menand, L. (2023). The Twilight of Neoliberalism. *The New Yorker*.

Merriam-Webster. (n.d.). Influence. *In Merriam-Webster.com dictionary*. Retrieved December 29, 2023, from https://www.merriam-webster.com/dictionary/influence

Merriam-Webster. (n.d.). Relevance. *In Merriam-Webster.com dictionary*. Retrieved December 29, 2023, from https://www.merriam-webster.com/dictionary/relevance

Mitchell, M., & Newman, M. (2002). Complex systems theory and evolution. *Encyclopaedia of evolution*, *1*, 1-5.

Mitzman, A. (1998, July 20). *Max Weber | Biography, Education, Theory, Sociology, Books, & Facts*. Encyclopaedia Britannica. https://www.britannica.com/biography/Max-Weber-German-sociologist

Montrie, C. (2018). *The Myth of Silent Spring: Rethinking the Origins of American Environmentalism*. University of California Press.

Mortensen, P. B., & Serritzlew, S. (2012). *Aaron Wildavsky*. Jurist- og Økonomforbundets Forlag

Mpetruzzello. (2020, 8 May). *Love Canal: A Toxic Tragedy | Saving Earth* | Encyclopaedia Britannica. Saving Earth | Encyclopaedia Britannica. https://www.britannica.com/explore/savingearth/love-canal

Nader, R. (1965). *Unsafe at any speed*. http://ci.nii.ac.jp/ncid/BB05915153

Nevada National Security Site. (n.d.). https://www.nnss.gov/pages/about.html

Nichols, E., & Wildavsky, A. B. (1987). Nuclear Power Regulation: Seeking Safety Doing Harm? *Regulation, 11*(1), 45–53.

Norris, F. H., Stevens, S. L., Pfefferbaum, B., Wyche, K. F., & Pfefferbaum, R. L. (2007). Community Resilience as a Metaphor, Theory, Set of Capacities, and Strategy for Disaster Readiness. *American Journal of Community Psychology, 41*(1–2), 127–150. https://doi.org/10.1007/s10464-007-9156-6

NU.nl. (2011). Dodental Alphen aan den Rijn blijft op zeven. NU.nl. https://www.nu.nl/binnenland/2489370/dodental-alphen-rijn-blijft-zeven.html

O'Hare, M. J. (1989). Searching for safety, by Aaron Wildavsky. New Brunswick NJ: Social Philosophy and Policy Cented Transaction Books, New Brunswick 1988. xii + 253 pp. *Journal of Policy Analysis and Management, 8*(3), 525–527. https://doi.org/10.1002/pam.4050080329

O'Neill, O. (2018). Linking Trust to Trustworthiness. *International Journal of Philosophical Studies, 26*(2), 293–300. https://doi.org/10.1080/09672559.2018.1454637

Ott, R., & Longnecker, M. (2015). *An Introduction to Statistical Methods and Data Analysis*. Cengage Learning.

Paehlke, R. (1989). The criteria of net benefit. *Society, 27*(1), 13–14. https://doi.org/10.1007/bf02695446

Patriarca, R., Bergström, J., Di Gravio, G., & Costantino, F. (2018). Resilience engineering: Current status of the research and future challenges. *Safety Science, 102*, 79–100. https://doi.org/10.1016/j.ssci.2017.10.005

Paul, G. (1993). Approaches to abductive reasoning: an overview. *Artificial Intelligence Review, 7*(2), 109–152. https://doi.org/10.1007/bf00849080

Pariès, J., Macchi, L., Valot, C., & Deharvengt, S. (2019). Comparing HROs and RE in the light of safety management systems. *Safety Science, 117*, 501–511. https://doi.org/10.1016/j.ssci.2018.02.026

Pariès, J. (2022). Conjectures and challenges of safety management. In *SpringerBriefs in applied sciences and technology* (pp. 105–111). https://doi.org/10.1007/978-3-031-07805-7_13

Pensyl, M. (2023). Blast from the PFASt: Forever Chemicals Coming Back to Haunt Us and How International Regulatory Schemes Can Supplement United States Law. *Joule: Duquesne Energy & Environmental Law Journal, 11*, 36–71.

Perlstein, R. (2023, August 18). *Watergate scandal | Summary, History, Timeline, Deep Throat, & Facts*. Encyclopaedia Britannica. https://www.britannica.com/event/Watergate-Scandal

Perrow, C. (1999). Normal accidents: living with high-risk technologies: with a new afterword and a postscript on the Y2K problem. In *Princeton University Press eBooks*. Princeton University Press. https://ci.nii.ac.jp/ncid/BA44792839

Perrow, C. (2007). *The next catastrophe: Reducing Our Vulnerabilities to Natural, Industrial, and Terrorist Disasters.* Princeton University Press.

Pew Research Center. (2022, October 26). Election 2020: *Two broad voting coalitions fundamentally at odds | Pew Research Center*. https://www.pewresearch.org/short-reads/2020/11/06/2020-electionreveals-two-broad-voting-coalitions-fundamentally-at-odds/

Political behavior | Encyclopedia.com. (n.d.). https://www.encyclopedia.com/social-sciences-and-law/sociology-and-social-reform/sociology-general-terms-and-concepts/political-behavior

Political economy | Definition, History, Types, Examples, & Facts Definition | Britannica Money. (n.d.). https://www.britannica.com/money/political-economy

Political methodology | Political Science. (n.d.). https://polisci.columbia.edu/content/political-methodology

Political Theory | Political Science. (n.d.). Stanford University. https://politicalscience.stanford.edu/research/political-theory

Polsby, N. W. (1985). The Contributions of President Aaron Wildavsky. *PS Political Science & Politics, 18*(04), 736–745. https://doi.org/10.1017/s1049096500022666

Polsby, N. W. (1994). In Memoriam: Aaron B. Wildavsky: 1930-1993. *Journal of Public Administration Research and Theory, 4*(1), 85–88.

Pressman, J. L., & Wildavsky, A. B. (1973). *Implementation: How Great Expectations in Washington Are Dashed in Oakland; Or, Why It's Amazing that Federal Programs Work at All, This Being a Saga of the Economic Development Administration as Told by Two Sympathetic Observers Who Seek to Build Morals on a Foundation.* University of California Press.

Quinn, M. S. (1996). Significant books. *Environmental Claims Journal, 8*(3), 169–182. https://doi.org/10.1080/10406029609379272

Rae, A., Provan, D. J., Aboelssaad, H., & Alexander, R. (2020). A manifesto for Reality-based Safety Science. *Safety Science, 126*, 104654. https://doi.org/10.1016/j.ssci.2020.104654

Rayner, S. (1990). Searching for Safety. Aaron Wildavsky. *American Anthropologist, 92*(3), 807–809. https://doi.org/10.1525/aa.1990.92.3.02a00810

Reporter, G. S. (n.d.). The future of business: what are the alternatives to capitalism? *The Guardian*. https://www.theguardian.com/sustainable-business/future-business-alternatives-capitalism

Research ethics and animal testing ethics. (n.d.). www.lu.se. Retrieved March 26, 2023, from https://www.staff.lu.se/research-and-education/research-support/research-ethics-and-animal-testing-ethics

Resilience Library - Resilience Engineering Institute. (2018, February 14). Resilience Engineering Institute. https://resilienceengineeringinstitute.org/resilience-library/

Rippl, S. (2002). Cultural theory and risk perception: a proposal for a better measurement. *Journal of Risk Research, 5*(2), 147–165. https://doi.org/10.1080/13669870110042598

Rose, R. (1994). Aaron Wildavsky: A Mensch fur die Ganze Welt. *Public Budgeting & Finance, 14*(1), 66–75. https://doi.org/10.1111/1540-5850.00999

Rothe, J. (1989). Regulating the deregulated. *Society, 27*(1), 11–12. https://doi.org/10.1007/bf02695445

Rothenberg, J. (1993). Social strategy and tactics in the search for safety. *Critical Review, 7*(2–3), 159–180. https://doi.org/10.1080/08913819308443293

Rumsfeld, D. (2011). *Known and unknown: A Memoir*. Penguin.

Safety and Risk: Searching for Safety: Studies in Social Philosophy &Policy, No. 10 by Aaron Wildavsky. (1989). *American Scientist, 77*(2), 182. https://www.jstor.org/stable/27855664

Sagan, S. D. (1993). *The limits of safety: Organizations, Accidents, and Nuclear Weapons*. Princeton University Press.

Schroeder, C. H. (1986). Rights against Risks. *Columbia Law Review, 86*(3), 495. https://doi.org/10.2307/1122636

Schulman, P. R. (2004). General attributes of safe organisations. *Quality & Safety in Health Care, 13*(suppl_2), ii39–ii44. https://doi.org/10.1136/qshc.2003.009613

Searching for Safety, Aaron Wildavsky. 1988. Transaction Books. 252 pages. ISBN: 0-912051-18-3 (P); 0-912051-17-5 I. $NA. (1990). *Bulletin of Science, Technology & Society, 10*(4), 244. https://doi.org/10.1177/027046769001000432

Sharpe, L. J. (1993). An Obituary: Aaron Wildavsky. *Public Administration*, 135–136.

Shin, D. C., Chey, M., & Kim, K. (1989). Cultural origins of public support for democracy in Korea. *Comparative Political Studies, 22*(2), 217–238. https://doi.org/10.1177/0010414089022002005

Short, J. F. (1990). Review Essay: Hazards, Risks, and Enterprise: Approaches to Science, Law, and Social Policy. *Law & Society Review, 24*(1), 179–198.

Short, J. L. (2019). The politics of regulatory enforcement and compliance: Theorizing and operationalizing political influences. *Regulation & Governance, 15*(3), 653–685. https://doi.org/10.1111/rego.12291

Silbey, S. S. (2009). Taming Prometheus: Talk about safety and culture. *Annual Review of Sociology, 35*(1), 341–369. https://doi.org/10.1146/annurev.soc.34.040507.134707

Sills, D. L. (1988). Out of this nettle, danger. . . *Nature, 334*(28), 363–364.

Smith, F. L., jr. (2017, May 31). Remembering Aaron Wildavsky. *Competitive Enterprise Institute*. Retrieved January 21, 2023, from https://cei.org/blog/remembering-aaron-wildavsky/

Snyder, H. R. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research, 104*, 333–339. https://doi.org/10.1016/j.jbusres.2019.07.039

Solomon, N. (2019, May 14). 50 years later, the tragedy of nuclear tests in Nevada - *FAIR*. FAIR. https://fair.org/media-beat-column/50-years-later-the-tragedy-of-nuclear-tests-in-nevada/

Taleb, N. N. (2010). *The Black Swan: Second Edition: The Impact of the Highly Improbable: With a new section: "On Robustness and Fragility."* Random House Trade Paperbacks.

T. Katzman, M. (1988). Searching for Safety. *Cato Journal, 8*(2), 557–559.

Terra, F. (2023). *The Economics of John Maynard Keynes*. Routledge.

The Editors of Encyclopaedia Britannica. (1998a, July 20). *Cassandra | Myth, Significance, & Trojan War*. Encyclopaedia Britannica. https://www.britannica.com/topic/Cassandra-Greek-mythology

The Editors of Encyclopaedia Britannica. (1998b, July 20). *Karl Mannheim | Ideology, Sociology, Theory*. Encyclopaedia Britannica. https://www.britannica.com/biography/Karl-Mannheim

The Editors of Encyclopaedia Britannica. (1998c, July 20). *WRIT | Legal process, court orders & civil Procedure*. Encyclopaedia Britannica. https://www.britannica.com/topic/writ

The Editors of Encyclopaedia Britannica. (2023, June 12). *Love Canal | Environmental Disaster, toxic waste & health effects*. Encyclopaedia Britannica. https://www.britannica.com/place/Love-Canal

Thoenig, J. (1993). In Memoriam. . . Aaron B. Wildavsky. *Politiques Et Management Public, 11*(3), 3–4. https://www.persee.fr/doc/pomap_0758-1726_1993_num_11_3_3383

Thompson, M., Ellis, R. J., Wildavsky, A., & Douglas, M., "Trustee." (1990). *Cultural Theory (Political Cultures Series)* (1st ed.). Routledge.

Troy, G. (2009). *The Reagan Revolution: A Very Short Introduction*. Oxford University Press.

Vaughan, D. (1996). *The Challenger Launch Decision: Risky Technology, Culture, and Deviance at NASA*. University of Chicago Press.

Vaughan, D. (1999). The Dark Side of Organizations: Mistake, Misconduct, and Disaster. *Annual Review of Sociology, 25*, 271–305. http://www.jstor.org/stable/223506

Vaughn, K. I. (1999). Hayek's Theory of The Market Order as An Instance of The Theory of Complex, Adaptive Systems. *Journal Des Economistes Et Des Etudes Humaines, 9*(2/3), 241–256.

Vanoost, L. (n.d.). 290 wetenschappers veroordelen positieve beoordeling glyfosaat door Europese Commissie. *DeWereldMorgen.be*. https://www.dewereldmorgen.be/artikel/2023/11/17/290-wetenschappers-veroordelen-positieve-beoordeling-glyfosaat-door-europese-commissie/

Venugopal, R. (2015). Neoliberalism as concept. *Economy and Society, 44*(2), 165–187. https://doi.org/10.1080/03085147.2015.1013356

Viscusi, W. K. (1989). Safety through markets. *Society, 27*(1), 9–10. https://doi.org/10.1007/bf02695444

Viscusi, W. K. (1990). Searching for Safety. By Aaron Wildavsky. *Journal of Economic Literature, XXVIII*, 1726–1727.

Vogel, D. (2012). *The Politics of Precaution: Regulating Health, Safety, and Environmental Risks in Europe and the United States*. Princeton University Press.

Walker, J., & Cooper, M. (2011). Genealogies of resilience. *Security Dialogue, 42*(2), 143–160. https://doi.org/10.1177/0967010611399616

Wehner, J. (2015a). Aaron Wildavsky, The Politics of the Budgetary Process. In S. J. Balla, M. Lodge, & E. C. Page (Eds.), *The Oxford Handbook Of Classics In Public Policy And Administration* (pp. 195–204). Oxford University Press.

Wehner, J. (2015b). Aaron Wildavsky,. *Oxford University Press eBooks*. https://doi.org/10.1093/oxfordhb/9780199646135.013.17

Wentzel, C. (2023). Dioxine, Pfas en de onzinnige chemofobie - De Groene Rekenkamer. *De Groene Rekenkamer*. https://groene-rekenkamer.nl/chemicalien/dioxine-pfas-en-de-onzinnige-chemofobie/

What is ALS? (n.d.). The ALS Association. https://www.als.org/understanding-als/what-is-als

Williamson, C., jr. (1989). The Right Books. *National Review, 41*, 64.

White, J. (1994a). An Overview of This Issue: In Tribute to Aaron Wildavsky. *Public Budgeting & Finance, 14*(1), 9–11.

White, J. (1994b). Working With Aaron Wildavsky: Edited Transcription of a Round Table in Remembrance of Aaron Wildavsky, October 15, 1993. *Public Budgeting & Finance, 14*(1). https://doi.org/10.1111/1540-5850.01000

Whittington, K. E., Kelemen, R. D., & Caldeira, G. A. (2010). *The Oxford Handbook of Law and Politics*. OUP Oxford.

Wildavsky, A. B. (1975). The richest boy in Poltava. *Society, 13*(1), 48–56. https://doi.org/10.1007/bf02699999

Wildavsky, A. B. (1979a). No Risk Is the Highest Risk of All. *AmSci, 67*(1), 32–37. https://ui.adsabs.harvard.edu/abs/1979AmSci..67. . .32W/abstract

Wildavsky, A. B. (1979b). *Speaking Truth to Power: The Art and Craft of Policy Analysis*. Little Brown.

Wildavsky, A. B. (1981). Richer is Safer. *Financial Analysts Journal, 37*(2), 19–22. https://doi.org/10.2469/faj.v37.n2.19

Wildavsky, A. B. (1985). *Trial Without Error: Anticipation vs Resilience as Strategies for Risk Reduction*. The Centre for Independent Studies.

Wildavsky, A. B. (1986a). On Collaboration. PS, 19(2), 237–248. https://doi.org/10.2307/419228

Wildavsky, A. B. (1986b). Defining Risk. *Science, 232*(4749), 439. https://doi.org/10.1126/science.232.4749.439-b

Wildavsky, A. B. (1988a). *Searching for Safety [Social Philosophy & Policy Center]* (1st ed.). Transaction Publishers.

Wildavsky, A. B. (1988b). Playing it safe is dangerous. *Regulatory Toxicology and Pharmacology, 8*(3), 283–287. https://doi.org/10.1016/0273-2300(88)90015-3

Wildavsky, A. B. (1989a). The secret of safety lies in danger. *Society, 27*(1), 4–5. https://doi.org/10.1007/bf02695442

Wildavsky, A. B. (1989b). Thanks for the commentary: Replies to critics and critiques. *Society, 27*(1), 28–31. https://doi.org/10.1007/bf02695452

Wildavsky, A. B. (1991). *The rise of radical egalitarianism*. University Press of America.

Wildavsky, A. B. (1996). Regulation of Carcinogens: Are Animal Tests a Sound Foundation? The *Independent Review, 1*(1), 29–54.

Wildavsky, A. B. (1997). *But Is It True?: A Citizen's Guide to Environmental Health and Safety Issues*. Harvard University Press.

Wildavsky, A. B. (2003). *The Revolt Against the Masses and other essays on politics and public policy*. Transaction Publishers.

Wildavsky, A. B., & Wildavsky, A. (2018, June 27). *Risk and Safety*. Econlib.org. Retrieved January 21, 2023, from https://www.econlib.org/library/Enc/RiskandSafety.html

Wildavsky, A. B., & Dake, K. (1990). Theories of risk perception: Who fears what and why? *Daedalus*. https://www.jstor.org/stable/pdfplus/20025337.pdf

Winters, J. (z.d.). Infographic: Consequences of Germany's Nuclear Phase-Out - ASME. www.asme.org. https://www.asme.org/topics-resources/content/infographic-the-unintended-consequences-of-germanys-nuclear-phase-out

Wolf, M. (2023). *The Crisis of Democratic Capitalism*. Penguin Press.

Woltjer, R., Johansson, B., & Lundberg, J. (Eds.). (2007). *Proceedings of the Resilience Engineering Workshop (Vol. 23)*. Linköping University Electronic Press.

Woods, D. D. (2018). The theory of graceful extensibility: basic rules that govern adaptive systems. *Environment Systems and Decisions*, *38*(4), 433–457. https://doi.org/10.1007/s10669-018-9708-3

Appendix A - Searching for Safety – the Book

After being published in 1988, the book *Searching for Safety* was promoted by the publisher as "an ambitious ground-breaking and controversial book," as is shown in the advertisement in Figure 1. The advertisement was placed at the end of the teaser of *Searching for Safety* in *Society* (Wildavsky, 1989a, p. 5). The teaser being an excerpt of the book's chapter 10: 'The Secret of Safety lies in Danger' being used as the openings essay for a symposium (See Appendix E). The reason that it was advertised as ground-breaking and controversial is such that Wildavsky promotes a risk-taking approach which was, and still is, not common in public policy and health and safety regulation.

The book itself consists of an introduction explaining the structure of the book and its aim. In addition, there are three sections: 1) Strategies, 2) Conditions, and 3) Principles (Wildavsky, 1988a). The four chapters of the first section: 'Strategies' deals with the then controversies over risk (i.e., carcinogens regulation, pollution reduction, and occupational safety). The second section deals with alternative methods for risk reduction (i.e., non-human lifeforms, nuclear power plant inspections, the evolution of the law of tort, and the human body). The third section sets out the principles that reduce harm and increase safety as explained by Wildavsky (1988a, pp. 10, 11, 12).

The introduction starts with a Wall Street Journal news excerpt of a famous jogger that, whilst jogging, died of a heart attack: "The Jogger's dilemma." The death of this jogger stirred controversy about benefits and risks of exercise (Wildavsky, 1988a, p. 1). Furthermore, he uses the example of the 'homely potato' (its jacket being healthy and poisonous at the same time), to illustrate that the safe and dangerous are intrinsically intertwined, an example he used as well in a lecture a year before the publication of this book (Libertarianism.org, 1987).

Wildavsky explains that the book is about how risk and safety are produced, and are derived from the same object, and what is required 'to make the search for better combinations both efficient and effective, actually improving safety' (Wildavsky, 1988a, p. 2). Wildavsky continues to explain that the book's subject is objective risk, being 'the observable dangers as well as the observable consequences undertaken to increase safety.' Wildavsky's preferred definition of risk is borrowed from Vlek and Stallen who argue that there are four types of risk: 1) Risk is the probability of loss, 2) Risk is the size of (credible) loss, 3) Risk is the expected loss, and 4) Risk is the variance of the probability distribution over the utilities

of all possible consequences. From these four, the latter was the preferred definition. This definition takes loss and gain into account, or in other words, both risks and opportunities (Wildavsky, 1988a, p. 229). It deviates from the then used definition where risk is defined as: "The probability that a particular event occurs during a stated period of time, or results from a particular challenge" (Royal Society, 1983).

The boundaries of the book are set when Wildavsky further explains that the book will not deal with 'the subjective aspects of safety'. By the latter, he means people's risk behaviour, or 'the overtly political aspects' or 'controversies' over risk (Wildavsky, 1988a, p. 3),' which he already discussed in the book he collaboratively wrote with Mary Douglas: *Risk and Culture* (Douglas and Wildavsky, 1982).

To further build-up his arguments for the key message of the book, Wildavsky introduces: 1) 'The Principle of Irreducible Uncertainty,' 2) The 'Axiom of Connectedness', and 3) 'The Rule of Sacrifice.' Using the first, he argues that risk will always be present, and that (unforeseen) consequences cannot be reduced to zero. The argument used is that no one is omnipresent and aware of all consequences. With 'The Axiom of Connectedness,' he refers to the fact that "safety and harm are intertwined in the same acts and objects." Wildavsky combines these two by arguing that "uncertainty cannot be eliminated as damage cannot be avoided." He further argues that the aforementioned combination can be applied to all known systems: "Each part of every system cannot be stable at the same time" (Wildavsky, 1988a, pp. 4-5). He refers to economist Burton Klein to back-up this statement (Klein, 1983).

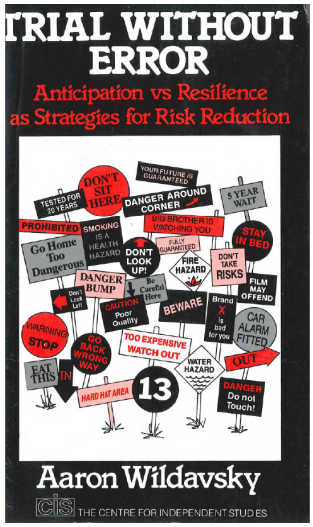
As already mentioned, the first section 'Strategies,' includes four chapters. Chapter one starts with one of the main principles of the key message of the book: 'Trial with error' versus 'Trial without error.' The latter meaning that "no change whatsoever will be allowed unless there is solid proof that the proposed substance or action will do no harm" (Wildavsky, 1988a, p. 17).

The second chapter 'Opportunity benefits versus opportunity risks,' is used by Wildavsky to explain why the precautionary principle is not the correct way forward. The third chapter 'Richer Is Sicker Versus Richer Is Safer' is a chapter that has been published earlier in a different form as an article in 1981,

called 'Richer Is Safer' in *The Public Interest*.[83] It is a continuation of Wildavsky's argument that subject of risk should not be about opportunity costs, but about net benefit. The fourth, and last chapter of the first section, is 'Anticipation versus resilience.' It includes parts that have been used in the earlier publication of the Australian Centre for Independent Studies (CIS)[84] in 1985 (Wildavsky, 1985, p. 9) to explain both as strategies for risk reduction (Figure 12).

Figure 12

Front cover Trial Without Error *(Wildavsky, 1985).*



The first chapter is about 'Trial with Error' versus 'Trial without Error.' By not taking error, one does not learn is Wildavsky's argumentation. It is not the ability to avoid error entirely, but learning how to overcome it, that is important for social life (Wildavsky, 1988a, p. 17). Although he admits that there are various shades of grey, he disagrees with 'Trial without Error.' Wildavsky considers David W. Pearce and Robert E. Goodin as examples of the 'the most persuasive exponents,' for their favour towards risk avoidance. As to why he considers them as such, is that the cited article of Pearce in the book (Wildavsky, 1988a, p. 19), is a proceeding of a conference about dealing with technological risk in the European

[83] The Public Interest is the title of an American public policy journal that was published from 1965 until 2005 which had a neo-conservative view and a focus on domestic public policy issues (Kristol, 2005).

[84] An Australian neo-liberal think-tank (Quiggin, 2022).

Community, advising to include risk avoidance in policy. The article of Goodin is related to the then newly started nuclear power controverse in the aftermath of the 'Three Miles Island' nuclear incident in 1979. Goodin positions himself clearly by declaring that:

> "It seems extraordinarily likely that all good that can ever come from nuclear power we can anticipate ahead of time, leaving only the evil to surprise us. Thus, society should contrary to economic advice, display the same aversion to large and uncertain risks of nuclear power as do individuals" (Goodin, 1980, p. 426)

By referring to a severe gas explosion in London in 1865, Wildavsky argues that Trial without Error (and indirectly the above positioning of Goodin), is a false doctrine:

> "Could anyone who planned to introduce gas heating or lighting have certified in advance that there would be no explosions, no danger of blowing up the city? I think not. Nonetheless, the gas industry, without such guarantees, did flourish" (Wildavsky, 1988a, p. 19)

Wildavsky (1988a, p. 19) points out that "the most persuasive and most common argument used against trial and error is that it should not be used unless the consequences of worst-case errors are knowable in advance to be sufficiently benign to permit new trials: the precautionary principle." This he called the model of risk aversion: "Nothing new will be done until there is evidence it will do no damage."

These arguments were posed earlier in a publication of the Australian Centre for Independent Studies (CIS) in 1985 which may be considered as a preliminary draft of this chapter in the book (Wildavsky, 1985, 1988a).

The 'No safe dose' is another frequently used argument to promote risk aversion (no trials without prior guarantees against errors) on the basis that the smallest probability of irreversible disaster overwhelms all other considerations (Wildavsky, 1988a, p. 23). The 'no safe dose' or also called 'no threshold' or 'one molecule theory' argues that a single mutagenic event can cause cancer. Wildavsky opposes this to point out the fact that virtually everything the human species do is linked with carcinogens, thus he concludes, "to ban carcinogenic substances, is to ban life since poisons are an integral part of nature (e.g., chemical warfare among plants, animals and insects)" (Wildavsky, 1988a, p. 25).

Wildavsky also introduces incrementalism (small additions based on existing knowledge) as another means of risk aversion, thus incrementalism whereby 'errors should be small, recognizable and reversible,' and therefore can keep the status quo, hence nothing changes. (Wildavsky, 1988a, p. 25). The use of incrementalism that Wildavsky prefers is vested in the fact that errors are small but progressive and are learned from: 'Trial with small errors.' He borrows this from his own work on budgeting (Wildavsky, 1979b). He argues that large numbers of frequently adjusted small errors allow testing of new phenomena before they become too big to cause harm (Wildavsky, 1988a, p. 27).

By playing it safe, prudential conservatism is considered gospel in public policy (Wildavsky, 1988a, p. 28). He addresses this by pointing out the tendency by designers to add unnecessary increased safety margins. He argues that if super cautiousness is the golden rule, and if there is no clear end point, this conservatism can be pursued to infinity up to the inevitable termination of the activity (Wildavsky 1988a, p.28). He uses the design of aircraft wings as an example of how safety margins should be used: the best-known probabilities are calculated, and subsequently the adverse effects of increasing the margin of error are interpreted. Air craft wings have considerably lower safety margins than civil structures since increased margins are making flying for airplanes impossible. "Making flights impossible or causing crashes is not usually recommended as a conservative measure to increase safety" (Wildavsky, 1988a, p. 29).

To support his own arguments against the 'Trial without Error' public policy, Wildavsky uses an article of Huber (1983). In this article, Huber (1983, pp. 23, 28) argues that: "federal regulation of health and safety is not only a major obstacle to technological transformation and innovation but also often aggravates the hazards it is supposed to avoid." He makes a distinction in old hazards controlled by standards, and new hazards controlled by screening. Furthermore, Hubert argues that "a screening agency regulates not on the basis of proven harm, but on the basis of unproven safety," and points out that: "The paradox of risk regulation is that too much of it makes life more dangerous. Not just more expensive, not just less convenient, but more dangerous" (Huber, 1983, p. 28).

Wildavsky introduces the economics of safety: "opportunity costs and opportunity benefits". The first is defined as "those different goods that otherwise might have been purchased with the same resources." The latter is defined "as those opportunities to reduce existing harms that society forgoes

when it decides to delay or deny the introduction of a new substance or technology" (Wildavsky, 1988a, p. 39).

The opportunity costs are described by Wildavsky as being made by economics: "These costs cannot be seen but only deduced from the traces they leave on other substances, so too economists have created a relationship whose only evidence lies in the indirect effects it has on the economy" (Wildavsky, 1979a, p. 157). He argues that this current comparing of risks to benefits is corrupt since it trades health for money and does not look at the opportunity benefits. He argues that "For if we do away with the risks, as per the 'Axiom of Connectedness', we may also eliminate even greater health benefits" (Wildavsky, 1988a, p.40). "No safety measure comes without a price. Sometimes the price going beyond effort and money includes increased danger in other areas or from other sources." (Wildavsky, 1988a, p.48). Wildavsky demonstrates this with the example of an abandonment of a drug (Benoxaprosen), that was taken of the market to increase safety. Afterwards, it turned out to be a life saver because of an unintended benefit, the reduction of thrombosis (Wildavsky, 1988a, p. 49). As Wildavsky summarises:

> "Risk taking can thus improve safety, and that safety risks can be damaging. Society can benefit by taking risks as well as by not trying to prevent them. If risk can increase safety, and if safety measures can increase risk, what criterion of choice can guide us through these apparent contradictions" (Wildavsky, 1988a p. 54).

The answer on the question raised above is 'net benefit:' "the difference between dangers reduced and dangers created." Safety measures are inputs, but the payoff comes from the outputs: the safety achieved (Wildavsky, 1988a, pp. 54, 55). He argues (1988a, p. 55) that "when substitutes for dangerous substances are deemed essential, a difficulty arises if no one knows what the risks of these replacements will be compared to those imposed by substances given up." Learning by trial and error will provide the answer whether the replacement has a greater net benefit than its predecessor is what Wildavsky promotes. He points out that:

> "Only through experience can the net benefit of substitutes be compared. The emphasis in trial and error is on discovering dangerous errors and correcting them. In case a dangerous error cannot be eliminated, it may be tolerated because of the net benefit" (Wildavsky, 1988a, p. 57).

The next chapter 'Richer Is Sicker Versus Richer Is Safer' is a chapter that, as already mentioned, has been published earlier in a different form as an article called 'Richer Is Safer' in 'The Public Interest,' in 1981. He introduces yet another argument regarding unbridled economic growth. He is objecting to what he considers the standard argument that this hurts the natural and human environment because of despoiled land, pollution, and diseased people. Wildavsky claims that people ask the wrong question since the debate about risk is about costs and benefits, but with the focus on costs and not necessarily including the benefits (Wildavsky, 1981, p.24; 1988a, p. 60). Based on the underlying basis that one can only spend a dollar once, he argues that the risk assessment should also include what the total of all expenditures to reduce risk would be worth in terms of increasing safety if these expenditures went in the economy instead. He makes this argument by taking the relation between health and wealth: Richer countries do have less death rates as poorer countries, thus "increasing the income of nations and classes is evidently one way of improving safety. To proof his point, he quotes from a study of Kitagewa and Hauser which was published in 1973:

> "The evidence indicates thar further reductions in death rates in the United States may be achieved more readily through programs designed to improve the socioeconomic conditions of the disadvantaged elements of the population than through further advances in biomedical knowledge" (Wildavsky, 1981, p. 26; 1988a, p. 62).

By referring to various studies and actuary tables from various sources, he further strengthens his point. Wildavsky concludes that "by improving countries or classes incomes, this increases their safety more than new efforts to reduce risk. If health and wealth are positively related, sacrificing one for the other may not only lead to less wealth but also less health" (Wildavsky, 1981, pp. 25-28; 1988a, pp. 61-63). The argumentation of the article and the book chapter follow the same line of argumentation; however, the conclusions differ.

Whereas the article focusses on the improvement in health and safety because of cheaper and more plentiful food as a result of mechanization. Wildavsky (1981, p. 29), argues that this better nutritious food also increased alertness hence decreased accidents. Due to the mechanization, there was less manual labour, and because of shorter working weeks, the worker was less tired. Both reduced the number of accidents even further. He further argues that with more economic activity the number of alternatives is bigger and have more variety, which increases the chance of higher safety with either unintended consequences or not (Wildavsky, 1981, p. 29).

Wildavsky had already identified 'The Principle of Irreducible Uncertainty,' The Axiom of Connectedness', and 'The Rule of Sacrifice,' in the article without naming them as such, to explain that: "the safety of the whole is a function of the willingness to sacrifice a part, the part being unknown, and the occasion unforeseen." He then argues that if every subgroup in the population were guaranteed against risk, and were always secure, how would shocks be absorbed, who then would pay the penalties? The losses could not be assigned to anyone; hence the social system would collapse, and there would be no learning at all.

As Wildavsky had already argued earlier in the chapter: "sacrificing one for the other may not only lead to less wealth but also less health." Since social risk reduction is an indirect process, it is not possible to predict who will be protected against what at which time as 'The Principle of Irreducible Uncertainty' ensures. He further explains that the politics of anticipation requires that all possible sources of risk need to be eliminated or mitigated, and that sources for this could be considered infinite: there is no limit on what can be spent. To assess case-by-case risks for certain groups is impossible since preventing risk from one group might unintendingly harm another group. Wildavsky claims that "the greater the effort to reduce risk, the less equal the risk is distributed among the population, so long as the debate over safety is about removing risks the outcome will continue to be unbalanced." He then asks whether or not society would be better off by increasing its resilience instead of futile efforts to ward off harm of unknown origin (Wildavsky, 1981, pp. 30-35). He concludes however, that both resilience and anticipation are necessary. Whereby the latter its only necessary if risks are palpable, and remedies ascertainable and populations limitable and dangers unavoidable (Wildavsky, 1981, p. 39).

In the concluding part of the article, Wildavsky hints towards a way of thinking that is now known as 'Safety II' (to look what goes well, as well as of what goes wrong (Hollnagel, 2014, p. 149): "Instead of focussing all our attention on risk, effort should also be devoted to understanding how and why we have become safer than our predecessors." Wildavsky argues that society has become safer by an increase in wealth indirectly causing an increase in health and safety rather than by directly reducing risks (Wildavsky, 1981, p. 38).

Based on a similar build-up in the line of reasoning as the aforementioned article, Wildavsky concludes the book chapter in promoting a neo-liberal view in favour of market competition, by claiming that "competition will increase income in wealth and subsequently people's well-being." His argument is as follows:

> "Market competition works to increase wealth so society can respond resiliently to dangers as they manifest themselves. Competition distributes the discovery process over the whole society (rather than concentrating in a few hands). By engaging many independent minds in the discovery process, competition speeds the rate of innovation-and the perception of incipient dangers that could result from innovation-while hazards are still small and localized. Competition fosters efficient use of resources, hence maximizing wealth and, indirectly, health. By increasing wealth, competition fosters resilience" (Wildavsky 1988a, p. 75).

The last chapter of the first section is 'Anticipation versus resilience,' Wildavsky's question for this chapter is whether risks are better managed by trying to anticipate them and prevent bad outcomes before they occur, or by trying to mitigate such effects after they have shown up. Wildavsky defines anticipation as follows: anticipation as "a mode of control by central cognition; potential dangers are averted before damage is done." He defines resilience as "the capacity to use change so as to better cope with the unknown; it is learning to bounce back" (Wildavsky 1988a, p. 77; 1985, p.9).

Wildavsky uses the works from ecologists Holling and Clarke to answer his own question. By quoting Holling, Wildavsky argues that anticipation emphasises uniformity: "the less fluctuation, the better." Resilience, on the other hand, he argues, stresses variability: "one does not so well in good times but learns to persist in the bad." The work of Clarke is used to promote resilience as the better strategy to

deal with variability, by pointing out that the decreased frequency of variation in an anticipation-based system was accompanied by increased vulnerability. Wildavsky considers resilience being the better strategy, as he claims that "the rationale for relying on resilience as the better strategy lies in life's inherent uncertainty; for if, try as we may, we are not likely to be successful anticipators, we can always resort to resilience."

Wildavsky point out that trials are necessary for identifying errors, for theory remains theory, and will not predict all inadequacies up front. He concludes that "a positive attitude towards failure can contribute to learning," hereby referring to fear of failure that might hinder learning (Wildavsky, 1988a, pp. 81 - 83). Wildavsky claims resilience as the better strategy, not the best strategy, since he identifies that if there are strict conditions – know what, know when, know how, know how much, and act as indicated: anticipation would be the better strategy, and not resilience. In particular circumstances, prevention by anticipation is thus considered better by Wildavsky, but only when you are quite certain know what to prevent, how to prevent it, and that the result is as such that you are better off than before the preventative measures were taken (Wildavsky, 1988a, pp. 85, 86). He argues that it makes sense to look at the total costs required by the preventive measure, wherever those costs occur, and to compare them with the improvement in health they produce" (Wildavsky, 1988a, p. 87). He advocates a combination of anticipation and resilience since by applying only one of them would be destructive. He argues that "the main limitation of a strategy of resilience is the potential for catastrophe, "since nobody wants to wait until something already has happened before reacting to it." He points out that we take anticipatory and resilient actions all the time (e.g., savings for a 'rainy day' which can be utilised in case it is necessary, thus applying resilience). (Wildavsky, 1988a, p. 83).

He argues that despite a combination of both, resilience remains the better strategy because of the reverse 'Cassandra rule'[85] (Wildavsky, 1988a, p. 91). Whereas the Cassandra rule implies that correct

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[85] Cassandra is in Greek mythology, the daughter the last king of Troy. Cassandra was loved by the god Apollo, who promised her the power of prophecy if she would comply with his desires. Cassandra accepted this, became a prophet, but then refused Apollo her favours. Apollo took revenge by ordaining that Cassandra's prophecies should never be believed. She

warnings are not to believed, with the reversed Cassandra rule, false warnings are to be believed. Rumsfeld (2011, p. xiv), makes a distinction between 'known knowns' (facts, rules and topics we know for certain), 'known unknowns' (gaps in our knowledge but we are aware that these exist, and which can be solved by asking the right questions), and 'unknown unknowns' (gaps in our knowledge and we are not even aware of that these exist). The latter is the easiest argues Wildavsky. Resilience for survivors, then, is the only thing that counts. The known knowns are easy as well: for one can apply an anticipation strategy. The 'known unknowns' are the most difficult. Because of the lack of knowledge, there is disagreement whether catastrophes will materialize. Wildavsky (1988a, p. 91) identifies that "knowledge is incomplete and uncertainty inherent, especially concerning low-probability events." Considering the reverse Cassandra rule, all possible threats must be regarded and may be misused by everyone by offering an alternative (highly improbable) catastrophic scenario. As Wildavsky (1988a, p. 92) claims: "The argument from catastrophe can be used to defeat all technological progress."

In Wildavsky's line of thinking, the 'known unknowns' are considered as quantitative surprises (we know it will happen but are surprised when it happens in another frequency or amount as we thought beforehand), and 'unknown unknowns' as the qualitative surprises (the real surprise). Wildavsky argues the growth of resilience depends upon learning how to deal with the unexpected by sampling it in small doses and diverse ways, thus by trial and error (Wildavsky, 1988a, p. 93).

Wildavsky's answer for society to remain resilient, is not by tolerating known and avoidable sorts of failure, but through economic growth and technical progress. Because of this, society learns to cope better with adversity, thus becoming more resilient.

> "Catastrophes can always occur. But where there is progress, we will have a much greater body of wealth. Knowledge and coping experience to draw upon: thus, growth and progress reduce the chances that 'ultimate' catastrophes actually will be ultimate" (Wildavsky, 1988a, p. 95).

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accurately predicted such events like the fall of Troy, but her warnings were not believed (The Editors of Encyclopaedia Britannica, 1998).

Wildavsky concludes that resilience is thus related to variety and redundancy. A balance among various options, makes more sense than just one or the other. (Wildavsky, 1988a, p. 97). Wildavsky's contemporary and political scientist Goodin critiques that resilience is no respecter of persons which Wildavsky agrees with (1988a, pp. 102, 242). Wildavsky argues that hurting minorities for the benefit of majorities requires a rationale for both anticipation and resilience: there are winners and losers in each situation. However, doing nothing is no option, using trial and error instead, should lead to an increase in wealth, knowledge and better coping mechanisms: thus, better resilience may result in a larger majority be better off (Wildavsky, 1988a, p. 103).

Wildavsky uses Section II of the book to further explain that resilience is the better strategy in life rather than anticipation. He uses four examples to illustrate the differing proportions of resilience and anticipation to strengthen his development of his hypothesis of the book: resilience is often (though not always) superior to anticipation. He argues that each example provided requires a different strategy, meaning a different combination of anticipation and resilience. The examples are:

1) How non-human life forms cope with danger,
2) The inspection of nuclear power plants,
3) The human body, and
4) The application of tort law (Wildavsky, 1988a, p. 107).

Wildavsky defends himself towards potential critique towards the selection of the above examples. He argues that these examples are deliberately chosen, like nature related examples (the human body and non-human life forms), and to make a hypothesis persuasive, it must lead to surprising results, which he claims the examples do have. By searching for safety, Wildavsky's aim is to provide a theory that connect outcomes of radical strategies: anticipation versus resilience (Wildavsky, 1988a, p. 109).

> "By showing in four different realms of life that safety is not just there for the taking but has to be searched for in innumerable combinations, I hope to open up doubting minds to the possibility that such case might be made" (Wildavsky, 1988a, p. 109).

For each of the examples, a summary with the conclusion(s) is provided below.

For the first chapter and example, Wildavsky draws heavily on the works of zoologist Watt and engineer Craig who identified 13 principles for ecological stability of which Wildavsky uses 12 off. Wildavsky translates these principles towards "a strategy that human beings might use in seeking safety" (Wildavsky, 1988a, p. 112). In Table 11, a summary per principle with the proposed strategy of Wildavsky next to it.

Table 11

12 principles

Principle	Explanation / example	Wildavsky's strategy
The omnivory principle - The greater the number of kinds of resources utilised in a complex system and the greater the number of pathways by which resources can flow to dominant system components, the less likely is the system to become unstable because of supply failure of any single source (Wildavsky, 1988a, p. 113)	Spreading the risk or 'don't put all your eggs in one basket' (Wildavsky, 1988a, p. 113)	Resilience strategy
The high-flux principle - The more resources are available per unit time to help deal with the perturbation (Wildavsky, 1988a, p. 113)	Once having been disturbed, a system will take longer time to recover if the necessary resources take a long time to reach it (Wildavsky, 1988a, p. 113)	Resilience strategy
The homeostasis principle – can be both negative as positive: the positive path is that stability is enhanced by negative feedback between components. The negative path is that stability is decreased by adding components without simultaneously providing for negative feedback mechanisms (Wildavsky, 1988a, p. 114).	Markets with prices responding freely to trends in supply and demand (Wildavsky, 1988a, p. 114).	Resilience strategy

Principle	Explanation / example	Wildavsky's strategy
The flatness principle – The wider the base of … organisational pyramids … relative to the number of hierarchical levels, the more stable they will be (Wildavsky, 1988a, p. 114).	Democratic regimes with widespread legitimacy can withstand damage to their leaders (e.g., assassination) better than dictatorial ones since the latter have a smaller legitimate base (Wildavsky, 1988a, p. 114)	Resilience strategy
System separability principle – system stability increases as the mean strength of interaction between components is decreased (Wildavsky, 1988a, p. 114)	Stability is enhanced by separating the elements of the system from one other. If each element of a system is closely coupled to the others through positive feedback, a breakdown in one quickly reverberates throughout the entire entity (Wildavsky, 1988a, p. 115).	Anticipation strategy
The redundancy principle – Reproduction of similar elements increases system stability since if one element fails, the other element takes over the initial function (Wildavsky, 1988a, p. 115).	Non-human life forms with many offspring to ensure survival because of loss of the majority of offspring due to various reasons (Wildavsky, 1988a, p. 115). Ashby's law of requisite variety – for each source of variety, there must be an equivalent source of redundancy in order to secure reliability (Wildavsky, 1988a, p. 116).	Resilience strategy
The Buffering principle – achieve stability by maintaining a surplus (Wildavsky, 1988a, p. 116).	The surplus serves to buffer the system against an unexpected increase in demand (Wildavsky, 1988a, p. 116).	Resilience strategy
The environmental modification principle – achieve system stability by altering the surroundings / environment (Wildavsky, 1988a, p. 116).	Termites control the humidity in their environment by making a large nest. (Wildavsky, 1988a, p. 116).	Anticipation strategy

Principle	Explanation / example	Wildavsky's strategy
The robustness principle – the ability of a system to passively withstand environmental damage (Wildavsky, 1988a, p. 116).	This may derive from a simple physical protection (e.g., armour on armadillo or turtle shell) (Wildavsky, 1988a, p. 116).	Anticipation strategy
The patchiness principle – maintain stability by making available many different types of resources (Wildavsky, 1988a, p. 117).	A catastrophe afflicting one piece or patch of the environment might not afflict another nearby. Each patch is weakly coupled with the others (Wildavsky, 1988a, p. 117).	Anticipation strategy
The over-specialisation principle – too much of a good thing may render systems unstable in the face of environmental change (Wildavsky, 1988a, p. 117).	An animal with a special feature suitable for one environment only may not be able to survive as that environment changes (Wildavsky, 1988a, p. 118).	Anticipation strategy
The safe environment principle – to create a permanently stable environment so that a system is immune to change (Wildavsky, 1988a, p. 118).	Instead, the organism adapts to the environment, the environment is so stable that no change is required (Wildavsky, 1988a, p. 118).	Anticipation strategy

Wildavsky argues that the principles marked as anticipation strategies, safe environment, modification and patchiness, work by preventing environmental change so that internal adaption is unnecessary. Changes are ruled out by searching for places that are permanently stable. The remaining three principles marked as anticipation strategies (specialisation, separability and robustness), anticipate change by absorbing environmental perturbations (Wildavsky, 1988a, p. 119). Furthermore, he argues that these aforementioned principles are overwhelmingly dependent on correct information (advanced information how to deal with the situation), since they are designed to prevent and not to respond and therefore not programmed to learn. As Wildavsky points out: "Experience cannot modify their behaviour." (1988a, pp. 119, 120).

The principles marked as resilience strategies are based on the assumption that unexpected distress is ever-present and unpredictable, and accurate and advanced information is mostly lacking thus learning from error is key. Wildavsky argues that the redundancy, omnivory, and high-flux principles "are analogues to knowledge, wealth (resource richness), and other generalizable resources" He further argues that the homeostasis principle is action-reaction. The high-flux buffering, and omnivory principle he considers as responsive principles in line with resilience, like the flatness principle, because of decentralised decision making (Wildavsky, 1988a, p. 120).

Wildavsky concludes that the environmental conditions under which anticipation or resilience are more or less appropriate strategies, are based on knowledge of what to do about dangers, and the predictability of change. So, if knowledge is large and predictability high: anticipation should rule. If knowledge is small and predictability low: resilience should rule. In case of the two other possibilities, it should be a mix of both where, based on the amount of knowledge or predictability, one or the other is the leading strategy.

The next chapter, and example, 'Does Adding Safety Devices Increase Safety in Nuclear Power Plants,' is an article collaboratively written with a graduate student of Wildavsky, Elizabeth Nichols. It is a longer version of an earlier article called 'Nuclear power regulation – Seeking Safety, Doing Harm?' which was published in the journal 'Regulation' in 1987 (Nichols & Wildavsky, 1987). Despite the chapter title, having a Perrowian sound, both chapter and article does not reference Perrow's work. Being a contemporary, Perrow, who coined 'Normal Accident,' argued that, "If interactive complexity and tight coupling-system characteristics inevitably will produce an accident, I believe we are justified in calling it a normal accident, or a system accident" (Perrow, 1999, p. 5) Nichols and Wildavsky argue that "the main threats to nuclear power safety today is the failure to recognise that individual safety systems may interfere with one other. Dealing with dangers by simply piling on safety measures is not necessarily – indeed is not often – an effective means of improving safety" (Nichols & Wildavsky, 1987, p.45; Wildavsky, 1988a, p. 139). Having a nearly similar line of reasoning, with regards to a system incident, Perrow and Wildavsky are clear opposites towards the use of high technology.

Nichols and Wildavsky argue that adding safety devices is not per se unsafe, though, they advise careful examination of the circumstances of what works best, by considering interaction of the individual devices with safety systems, both mechanical and organizational. They acknowledge that this is easier said than done, since "there is a strong bias towards believing safety measures must improve safety" (Wildavsky, 1988a, p. 127).

Wildavsky uses the outcomes of a study about inspection of nuclear power plants to reiterate the argument that "Each part of every system cannot be stable at the same time" (Wildavsky, 1988a, pp. 4-5), thus safety of the parts versus safety of the whole. The article identifies two ways of inspection: Inspection by detailed specification per part, or inspection by using performance standards for the whole system or large chunks of it. Nichols and Wildavsky have their preference for the latter since that is considered by them the most resilient strategy to inspect and takes the "safety of the whole (the nuclear installation) into account" (Wildavsky, 1988a, p. 134). The argumentation for this is explained below.

Nichols and Wildavsky thus argue that political and institutional pressures have a strong bias towards believing safety measures must improve safety. That these may interfere is recognised by the personnel operating nuclear power plants. Nichols and Wildavsky provide many examples as proof that safety systems interfere, resulting in adverse outcomes (e.g., thermal insulation preventing early discovery of cracks in pipes, the Chernobyl 4 Nuclear plant on-line testing to increase reactor safety by adding an additional source of emergency power, to name but a few). Nichols and Wildavsky (1988a, p. 131) explain that each design element competes with the other design elements, hence a design can never be optimized at the same time. one of the interviewees of Nichols and Wildavsky, explains that perfection of the parts may not always result in a better whole, one has to compromise, which when related to safety, may be considered as blasphemy. The interviewee concludes that designing each part in splendid isolation will not address how all these parts will act as a whole (Wildavsky, 1988a, p. 131). Nichols and Wildavsky explain that inspection is based on detailed prescriptive regulation which has only increased over the years because of operational incidents (e.g., Three Miles Island) and changing opinions of what the boundaries of a nuclear power system actually are (from reactor only, to all systems needed for safe shutdown).

This has resulted in a clear discrepancy between tasks described and tasks performed of the assigned inspectors in inspecting nuclear power plants which are related to plant size, distance between locations, and complexity of what to inspect including all the safety measures to be taken (Wildavsky, 1988a, pp. 134-135). Because of the detailed descriptive regulations there are conflicts between how to increase safety for one system whilst maintaining or increasing safety in another system. The argument made by Nichols and Wildavsky, is to look at the whole system and to change to performance standards: more general regulations. These prescribe operational performance levels and safety systems performance levels. By doing this, they argue, one can utilise operational approaches where can be learned from experience: trial by error, becoming more resilient in favour of the current dominant strategy of anticipation in the nuclear power industry (Wildavsky, 1988a, pp. 141, 147).

Wildavsky utilised Dennis J. Coyle, another graduate student, for the next example in chapter 7. This chapter is about how the human body defends itself. Wildavsky uses this chapter as proof, once more, that resilience is the better strategy in the defence of the human body. As Coyle and Wildavsky argue:

> "The human body faces risks that are multiple, varied, and unpredictable: multiple in that there are many sources of potential injury, varied in that the body is vulnerable to many types of damage, and unpredictable in that the body cannot know which disturbances it will encounter and when" (Wildavsky, 1988a, p. 150).

Coyle and Wildavsky claim that the human body is a successful example of combining a tad of anticipation with a mass of resilience to secure a sensible degree of safety on a 'limited budget.' The human body defences are based on damage limitation and there is not one preferred defence but a combination of various defences to ward off the hazards (Wildavsky, 1988a, p. 151). The level of danger (either internal or external) to the human body, is based on context, specific location, and dose (Wildavsky, 1988a, p. 152). Only having defence mechanisms in place does not ensure survival of the species, developing effective growth mechanisms is also a must, or as Coyle and Wildavsky put it: "Life must go on after the battle is won" (Wildavsky, 1988a, p. 154).

The types of defence are categorised as combatants (mechanisms that fight threats immediately), and non-combatants (mechanisms that provide back-up by means of growth or recovery). A combination of both is used by the human body for either prevention or mitigation. The 'whole is stronger than the parts' recurs when it is discussed by Coyle and Wildavsky that the body appears to value growth over defence. They argue that, when various defences are viewed on their own, these might be considered as sub-optimal, and when mixed with the other defences, these become more optimal based on context, specific location, and dose. However, humans die of diseases, accidents, etc, so the defences have a certain maximum threshold: they do not provide immortality. "Health requires energy, endurance, strength, and skill as preventive defences," argue Coyle and Wildavsky (1988a, pp. 155, 156). They argue that mechanisms of growth and behaviour helps the body to avoid damage as these are considered the 'Corpse Diplomatique' of human body's defence system. They have the potential to detect threats and to make appropriate adjustments to avoid confrontations. If these mechanisms work, then the human body does not need to fight. If diplomacy fails it's up to the combatants to defend the human body (Wildavsky, 1988a, p. 156).

The human body is searching for safety by exploiting more than one strategy at once, since risk is inevitable and no defence is perfect. The various strategies exist of overlapping mechanisms like barriers, excretion, detoxication, and immunity, to name but a few. Coyle and Wildavsky consider the human body as an extremely complex organism. To try to make sense of the body defences requires to deal with a variety of systems, organs, strategies and tactics (Wildavsky, 1988a, p. 162). "The essence of the body's defence system is this rapid transformation of energy and matter in response to an attack," explain Coyle and Wildavsky (1988a, p. 164). The 12 principles of Watt and Craig, as described in the previous chapter of the book, apply here as well. By instilling these principles, the human body has created a defence system with mechanisms that allow the body to survive whilst under constant attack (Wildavsky, 1988a, p. 165).

Cole and Wildavsky argue that that the variety of dangers are endless, the human body resources are not, hence a full anticipatory defence is impossible. The body cannot put all its forces in defences to combat the dangers since it has to grow as well for survival (Wildavsky, 1988a, p. 166). Cole and Wildavsky argue that the body has only a limited emphasis on anticipatory mechanisms since the body

cannot consciously anticipate future needs although mechanisms like barriers (e.g., skin), or excretion (e.g., vomiting) are considered anticipatory. The mechanisms for repair and replacement are considered by Cole and Wildavsky as the most resilient mechanisms in the human body defence system, since "they fully pursue the principles of homeostasis and plasticity, relying on quick feedback and resource transfers when enemies strike" (Wildavsky, 1988a, p. 168).

As already mentioned, the human body defence system can do a lot, but not all, since death is certain for all human beings. As Coyle and Wildavsky (1988a, p. 168) conclude:

> "The body's defences can only fight off as many enemies as possible, for as long as possible, while at the same time getting on with life. If resilient defences are successful, the species may succeed, though each individual will eventually die."

The last chapter, and example, of section II is a collaboration with graduate student Daniel Polisar. It discusses the evolution of the USA's tort law.[86] The aim of this example is to proof that over the years, the USA's tort law has been transferred from a resilient law into an anticipatory piece of legislation. Polisar and Wildavsky confirm that the law has undergone some drastic changes over the years which have made it easier for injured parties to collect compensation. They disagree with the central justification to make unsafe behaviour more costly; tort law would make society safer (Wildavsky, 1988a, pp. 169, 170).

The initial USA's tort law was initially based on the English system of writs.[87] The basis for the tort law was for unintentionally inflicted injuries' negligence. If one party had acted negligently, thus

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[86] Tort law refers to the set of laws that provides remedies to individuals who have suffered harm by the unreasonable acts of another. The law of tort is based on the idea that people are liable for the consequences of their actions, whether intentional or accidental, if they cause harm to another person or entity. Torts are the civil wrongs that form the basis of civil lawsuits (Cydni, 2019).

[87] A writ, in common law, is an order issued by a court in the name of a sovereign authority requiring the performance of a specific act (The Editors of Encyclopaedia Britannica, 1998).

causing injury to another party, he was held to be liable for damages suffered. The injured party had to proof the following: 1) That the defendant's action had caused the injury, 2) The defendant owed a 'duty of care', and 3) The defendant disowned the latter. Proof of fault was the overarching principle. Injury itself was not sufficient proof. Unless the defendant had done something wrong, he was not held liable (Wildavsky, 1988a, p. 171).

The duty of care for the defendant increased after a court ruling stated that the aforementioned could exist without a contract; impersonal markets required that duty be extended to strangers with whom one had no direct contact (Wildavsky, 1988a, p. 172). This was further increased after another court ruling that stated that a product with a defect strongly implied that there must have been negligence, even if there was no tangible evidence. The basis for this ruling was based on the precedent that a higher standard of care was required by manufacturers involved in making 'dangerous goods,' like poison or dynamite (Wildavsky, 1988a, pp. 172, 173). Negligence was shifting to liability without fault. If there was an injury, the producer or seller must have been at fault, as was argued successfully in many court cases. The negligence law doctrine "Res Ipsa Loquitur "[88] became more and more used (Wildavsky, 1988a, p. 173). As they point out: "Tort law no longer consists of discrete responses to particular situations. It becomes another means of regulation by attempting to balance a variety of social costs and benefits" (Wildavsky, 1988a, p. 173).

The rational for the negligence law doctrine is that the relation between buyer and seller is considered inequal, therefore court rulings have merely been in favour of what Polisar and Wildavsky call "the helpless consumer that cannot cope with new technologies." Only if manufacturers understand their product, then it is considered safe for the consumer. This is not only for its intended use, but also for any 'reasonably foreseeable use.' This means that a product that is safe for a wide range of uses might still be ruled defective if it fails to perform safely, even when used in doing things for which it had not been

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[88] A doctrine or rule of evidence in tort law that permits an inference or presumption that a defendant was negligent in an accident injuring the plaintiff on the basis of circumstantial evidence if the accident was of a kind that does not ordinarily occur in the absence of negligence ("Definition of Res Ipsa Loquitur," n.d.)

designed. Polisar and Wildavsky question: "Since tort law, unlike regulation, has no quantitative standards, how can a company make decisions about an acceptable level of danger?" They also point out that it is difficult to measure 'fairly acceptable,' let alone to grasp 'foreseeability,' hereby referring to 'hindsight bias'[89] without calling it as such.

'Contributory negligence' was the next change in tort law. Based on different formula's as adopted by the individual States for either the plaintiff or the defendant. The plaintiff could be compensated for a percentage based on the percentage of injury reduced by the percentage of own fault identified (contributory negligence), or the defendant could be charged with a contributory percentage of the fault (comparative negligence). The latter became more and more popular and had as result that the plaintiff's fault could not be used anymore. Polisar and Wildavsky (1988a, pp. 178-179) conclude that "it opened up a new class of suits by people whose accidents were caused by their own negligence."

In the same time period (1960s – '70s), the immunity of governments in civil law suits was lifted. Plaintiffs started to focus on 'deep pockets,' the corporations and municipalities that can pay large sums of money. The argument was that if these were found at fault, they could pay all costs (Wildavsky, 1988a, p. 179). Polisar and Wildavsky (1988a, p. 179) highlight that municipalities are sued the most, since they can be held partially attributable for any accident within their jurisdiction (a broken street lamp, not a wide enough road, a view blocking bush, etc.). Most municipalities prefer to make generous settlements outside of court, in order to avoid even higher fees, and/ or compensation to pay. Polisar and Wildavsky explain that not every municipality can insure themselves, only large cities like New York or Los Angeles can, the rest of the municipalities require liability assurance of which the premiums are sharply increasing. So sharply, that town councils are forced to cut vital services, raise taxes, or go bankrupt all together, paradoxically decreasing safety (Wildavsky, 1988a, p. 181). Polisar and Wildavsky argue that insurance is

[89] The tendency, upon learning an outcome of an event—such as an experiment, a sporting event, a military decision, or a political election—to overestimate one's ability to have foreseen the outcome (Inman, 2016).

anticipatory, and money is used to prepare for the known quantity: "the failure to avoid liability," instead of combatting known or suspected dangers (Wildavsky, 1988a, p. 182). They summarise that:

> "When a negligence standard was the dominant rule, tort law did encourage strategies of resilience. Decision making was decentralised, and actors were not required to anticipate every possible danger. Liability resulted only from failure to anticipate and prevent dangers that could have been reasonably foreseen. Resources were saved that could be used to reduce damage from accidents that did occur" (Polisar and Wildavsky, 1988a, p. 183).

Polisar and Wildavsky identify four trends that caused resilience to make way for a more anticipatory approach. The trends being: 1) Strict liability standards (especially for design effects) have caused juries to avoid balancing smaller risks against larger risks, 2) Acting under uncertainty regulators tend to make requirements too restrictive for fear of making a mistake that would make them liable, 3) Changes in tort law have forced unnecessary anticipation, even under conditions of high certainty, and 4) The movement towards strict liability has tended to keep new products or services off the market. Polisar and Wildavsky claim that companies are forced to act as regulators by avoiding launching products that might cause direct harm, and hereby ignoring concrete safety benefits that may be included in the product or service. Furthermore, large liability results in the fact that people are not able to get products that might be better for them anymore (Wildavsky, 1988a, pp. 183-185).

They conclude that, when the tort law became focussed on anticipation, it stopped to promote safety:

> "Instead of searching for safety by finding actual cases reasonably related to negligence, tort law tried to become smart ahead of time by defining damage as negligence. Once blame was assumed, all that remained was to find someone nearby who could pay." "By locating the richer rather than the responsible party, the connection between prevention and safety was lost" (Wildavsky, 1988a, pp. 185, 186).

Wildavsky indicates that the aforementioned four chapters (and examples) show that balancing anticipation with resilience appears to be working well when taking for each example the viability of the

strategies for securing safety into account. Only relying on anticipation showed that this results in severe effects, warns Wildavsky (1988a, p. 186).

Searching for Safety has one section left: Section III. This section contains two chapters. Wildavsky uses the first chapter to review a diversity of efforts to improve safety. The second, and final chapter, he uses to propose "a more promising set of principles" (Wildavsky, 1988a, p. 186).

Chapter 9, titled 'Less is more, a taxonomy of errors,' is a collaboration as well. This time with William R. Havender, a risk expert. The chapter starts with various examples of risk. These appear to be the introduction towards their argument that there has been an immense growth towards health and safety concerns. The US Government has responded by setting-up a variety of agencies to deal with these risks based on the assumption: the more safety measures, the better. Havender and Wildavsky argue that insufficient attention had been paid towards the effect of the measures taken in increasing the same or other risks (Wildavsky, 1988a, pp. 189 – 191). They further argue that six categories of such error are to be identified by:

1) Ignoring opportunity net benefits,
2) Ignoring the safety risks related to the proposed measure taken,
3) Ignoring the large existing benefits by only concentrating on small existing risks,
4) Ignoring the economic cost effects on safety,
5) Ignoring the trade-off between errors of commission and errors or omission (Type I versus type II errors), and
6) Ignoring the displacement of risk to others.

These categories have all one error in common, argue Havender and Wildavsky: They focus all on one dimension instead of the multiple dimensions of safety and risk (Wildavsky, 1988a, p. 191).

The remaining chapter is used to provide a more detailed explanation of each category. For the first category 'Ignoring Opportunity Benefits,' Havender and Wildavsky state that:

> "Decisions to delay introducing new technologies may be motivated by a fear of new dangers associated with innovation. But all too frequently, opportunities to reduce existing risks through

innovation are merely ignored, and thus never properly brought into the balancing of risks and benefits" (Wildavsky, 1988a, p. 191).

To prove their statement, they bring an assortment of examples into the limelight, such as the introduction of new drugs which has to be proven safe before it is marketed which takes a couple of years. This brings an unnecessary delay as said by Havender and Wildavsky (1988a, p.191): The prolonged illnesses and unnecessary deaths. The reduction of the chance of adverse effects of a hasty introduction is a lesser risk than the missed opportunity benefits as they argue. The examples provided are all related to the introduction of new technology (e.g., food irradiation, genetic engineering, and a mechanical artificial heart). Havender and Wildavsky reiterate their point with each example that "the readily realisable opportunity benefits have often been foregone" (Wildavsky, 1988a, pp. 192-194).

The second category of error is to 'ignore the risk associated with a proposed remedy.' Havender and Wildavsky argument for this category is that when a substance is used, a lot is learned (though not everything). They argue that one gets a feel of the risks related to the substance. Even in case of adverse effects, they claim, there is no point to get rid of it. Only when one is prepared to do without or have a better alternative. Again, examples are used to make their point: The replacement of the pesticide DBCP for EDB which was then replaced by Telone II. After introduction of both EDB and Telone II adverse effects were found and respectively the respective substances were banned from use. However, both were introduced as 'safer' alternatives for DBCP. Another example used was the use of a chemical TRIS to make children pyjamas fire retardant. The chemical appeared to work great, only it was absorbed by the skin when the pyjamas were worn, hereby increasing the chance on cancer. Thus, the lessons learned, as argued by Havender and Wildavsky, is not that chemicals should not be used until we know everything about their future effects. "The lesson learned is that continuity with a known chemical is likely to be safer than change, because the chance is larger that we know more about the existing substance than its alternative" (Wildavsky, 1988a, pp. 195-196).

'Ignoring large existing benefits while concentrating on small existing risks,' is the third category explained. The opening statement made by Havender and Wildavsky is "That many times the remedy is worse than the disease." Or in other words: safety precautions taken, may lower smaller risks but are

increasing more larger risks." This statement is once again backed-up by examples to prove their point. One of the examples is the use of PCBs in electrical equipment (e.g., a transformer). PCBs had more than adequate electrical properties, a lower toxicity and were fire retardant. PCBs were the flavour of the month and became the standard to replace mineral oil, which was highly flammable, until it was discovered that, as a result of animal tests, PCBs could cause cancer which resulted in a ban and the reintroduction of mineral oil in transformers. The immediate and real risk from fires is being increased in order to reduce the hypothetical, and long delayed risk of cancer. Havender and Wildavsky consider this a clear example of this category of error (Wildavsky, 1988a, p. 197).

The next category of error is 'Ignoring the effects of economic costs on safety.' Havender and Wildavsky argue that "If wealthier is healthier, then it is important for global resources to be large, growing, and flexible." Their argument is based on the following examples: 1) Requirements of the US Clean Air Act that mandates scrubbers to reduce sulphur oxide emissions despite cheaper existing alternatives to have a similar reduction, 2) The elimination of a smoke detector which has an ionising unit in favour of a more expensive alternative, and 3) That despite the Orphan Drug Act, a federal aid for developing and marketing drugs that otherwise would be commercially impossible, the price of these funded drugs will be too high. Havender and Wildavsky conclude that because of the higher costs of the examples given, not all people will benefit from the safety provided since they cannot afford it (Wildavsky, 1988a, pp. 198, 199).

Before Havender and Wildavsky explain the 'trade-off between type I and type II errors', an explanation of the definition and differences of both type of errors is provided: "An error of commission (Type I) is a false alarm for a non-existing hazard. An error of omission (Type II) is one of falsely ignorance of an existing hazard" (Wildavsky, 1988a, p. 199). They explain the types of error and their trade-off by means of Prokofiev's 'Peter and the Wolf.' Havender and Wildavsky consider the boy Peter's first alarms, errors of commission. His final alarm, the boy not believed anymore by the villagers, is considered an error of omission since the wolf was actually present. Havender and Wildavsky make a parallel between this story and the then current US government regulatory framework for identifying carcinogens (Wildavsky, 1988a p. 199, 200). They claim that because of the enormous scientific uncertainties related to the use of animal tests for identifying cancer causing chemicals by humans, has

made it necessary to err on the side of safety. This results, "that valid cancer signals are lost in a swarm of signals from trivial or even falsely identified risks," which they consider as a considerable loss of discriminatory power. They continue their argumentation that, because of this, a lot of resources are used on small risks, whilst the public's exposure to carcinogens continues. This is considered by Havender and Wildavsky not the correct trade-off (1988a, p. 201).

'Ignoring risk displacement' is the final category of error which is again backed-up with many examples, like

1) By making higher chimneys so local pollution is remedied but is transferred to other areas,
2) The transfer of toxic waste to, so called, secure dump sites of which no-one knows how secure these dump sites actually are, and
3) the use of substitutes for the substance EDB, used for fumigation of fruit and grains, which made the risks of exposure to workers substantially larger (Wildavsky, 1988a, pp. 201, 202).

Havender and Wildavsky conclude that the "patterns of unanticipated consequences, as demonstrated by the examples per category, suggest a madness in the anticipatory risk method applied" (Wildavsky ,1988a, p. 202). They argue that by focusing on anticipatory measures, resilience was neglected, and a lesson is learned: Do not increase anticipatory measures but do increase resilience.

The final chapter of the book, titled 'The secret of safety lies in danger', is used by Wildavsky to make his stand by reiterating the key messages of the book *Searching for Safety*.

Wildavsky (1988a, p. 205), begins the chapter by arguing that "No available evidence about safety and danger is likely to resolve current disputes about the consequences for life of new technology." He argues that aside the lack of sufficient knowledge, the conflicts are largely social and not scientific. Wildavsky reasons that perceptions of what is safe and what is dangerous is also a political act since "they imply judgements about the societal institutions that produce these goods and bads" (Wildavsky, 1988a, p. 205).

Being a political scientist, Wildavsky identifies that he is fully aware that it is not only a sum of the total damage but also the distribution of risk what matters. "If there are changes in perception of who

gains and losses," Wildavsky argues, "likely there will be changes in the willingness to accept risks" (Wildavsky, 1988a, p. 205). By referring to comments received from a contemporary, who argued that the public is under the impression that innovations benefit society in a disproportionate manner, whereby the implementors gain the most and the ones the lesser or non-political power and knowledge will bear the costs".

Wildavsky's answer is: "Richer is safer" (Wildavsky, 1988a, p 205). "To raise the standard of living helps the poor," he argues, "since their health is also not the richest either." Wildavsky continuous his argument by pointing out that the poor have more to gain from progress (Wildavsky, 1988a, p. 206). Wildavsky agrees that one should be concerned indeed when systematic harm is imposed on the most vulnerable in society. However, he questions whether the respective help or harm results from either a risk-averse or risk-taking position. Wildavsky questions this because he is unaware whether the health and safety of the poor is considerable better in less advanced societies (1988a, p. 206).

By taking a safer society as the shared objective, Wildavsky argues, one has to think about risk and safety. Safety is a search process to find the right balance for a safer society. Risks and benefits are separately intertwined; thus, these should be balanced with the safety they can offer. A differentiator would be the consideration of the net benefit in risk assessments (Wildavsky, 1988a, p. 207). He further argues that nature itself is doing the act of balancing the safe and the dangerous: trial by error. Wildavsky (1988a, p. 207) states that "The safety we seek is bound up in the danger that accompanies it." The anticipatory assumptions of:

1) Trial without error, and
2) Knowing in advance the actions that will increase or decrease safety, thus allowing the good and stopping the bad, are impossible to meet.

For the reasons that one cannot test without any harm (risks and benefits intertwined), and society cannot predict the actions as listed under 2). Wildavsky continuous his argument, that because of these assumptions, actions are prevented that may have improved safety, and may have caused more harm to the public instead (Wildavsky, 1988a, p. 208).

Because of the searching, Wildavsky considers safety as a process and not as a condition. He considers it not comparable with evolution since that does not guarantee optimisation. Wildavsky argue that there is no stable optimum, hereby using examples from Darwin's evolution theory (e.g., the power of the forces of natural selection of a species: The fitter survives but is not necessarily the fittest, and the successful introduction of new species in an existing biota). Wildavsky (1988a, p. 209), states that "because there is no stable optimum, there is always room for improvement in safety through the generation and testing of new combinations."

He continuous his argument by pointing out that, since safety is a process, it could also decline. Wildavsky argues that life could be fuller of risks or safety as it is: constant effort is required to have no declining safety, and to improve by using the advantages from unknown prospects of improvement. He reiterates that there are risks from new trials of products as well as opportunity benefits to be lost if one fails to reduce existing harms (Wildavsky, 1988a, p. 209).

Not only safety can decline, but it is also relative, Wildavsky argues that "we are being safer than we used to, but that does not mean that in future, we are just as safe as now. New dangers may arise or existing dangers, not experienced yet, may be introduced." An example of the latter is the following: In 2011, the Netherlands experienced the one and only mall shooting so far, for example, the USA experienced already since 2020 about 500 shootings at major supermarket chains alone (Nu.nl, 2011; Cain, 2022). Wildavsky further argues that "safety decays because products and practices that once were helpful become harmful under altered circumstances." He claims that a manner to prevent this decay, is to arrange for random distresses that improve the safety by finding new and better ways or to be more resilient by trial and error. The aforementioned in an incremental and decentralised manner, hereby making it manageable (Wildavsky, 1988a, pp. 211, 212). By admitting that it is not a perfect strategy, Wildavsky claims that the overall result by increasing resilience is that there is no decay observed but a steady improvement of safety since the industrial revolution instead. "Apparently, we have done something right" (Wildavsky, 1988a, p. 212).

Wildavsky states that technology is no one-way street, it can damage as well as improve matters. The kind of safety as being discussed in *Searching for Safety*, is about "the damage versus the improvement

to individual health stemming from technology,' as Wildavsky explains, "This kind of safety may be achieved at the expense of other values and therefore other senses of safety people hold dear" (Wildavsky, 1988a, pp. 212, 213).

He argues that improvements in physical health, could also be achieved at the expense of other values hence other senses of safety people hold dear, like liberty, security, etc. Wildavsky reflects that "health is not heaven and there may be many 'safe' ways to a variety of hells" (1988a, p. 212). He claims that the wealth related to the human health may have devastating effects on the other valued aspects of life. For instance, a decrease in adversity of people since 'safe' is 'soft:' it will be harder to cope with harsher circumstances. Wildavsky argues that decadence is another result of wealth: Material indulgence.

Wildavsky indicates that there are important social factors in the development of resilience. Wildavsky hopes he has proven the importance of two of them, or, what he calls the general resources: knowledge and wealth. He points out that the willingness and ability to deploy these, he considers as a function of different types of social relations, which are relevant, but are outside the scope of the book.

He argues that, perhaps of misplaced nostalgia, it seems that, nowadays, there are maybe more dangerous objects and technologies around than in the past. Wildavsky claims that these can make people safer in new ways with something extra. That something extra increases resilience because it can be used for diverse purposes. He continuous his claim by stating that the process increases alertness and the product increases resilience (Wildavsky, 1988a, p. 213). He concludes:

> "Whatever it is that has made us safer than our predecessors must be understood if we are to try to do better-or, not mistakenly do worse by eliminating that which has helped us" (Wildavsky, 1988a, p. 213).

The adage of 'Past performance is no guarantee for future results,' is Wildavsky well aware off. He reflects that the improvements in safety since the industrial revolution may have been purchased at the cost of future losses in safety. He provides examples like the depletion of the ozone layer, loss of irreplaceable resources, the spread of cancer-causing chemicals, and the decline of global position (hereby referring to the USA), and subsequent increase in disease and injuries. Nonetheless, he remains optimistic

since he claims that "knowledge has overcome adversity. More than that cannot be said" (Wildavsky, 1988a, pp. 214, 215). Wildavsky cites Kenneth Boulding to prove his point:

> "The most crucial knowledge of all, leads to the release of resources for the pursuit of knowledge." This self- multiplicative property of knowledge, by which it serves to transgress the fundamental law of conservatism, may be the base explanation, not only of phenomena like economic development, but even the whole evolutionary process" (Wildavsky, 1988a, p. 214).

Wildavsky argues that knowledge increases wealth, which releases resources to increase knowledge. Even if the there is a decrease in wealth, knowledge, and other resources, the physical health will decrease as well. Nonetheless, Wildavsky argues, it is still necessary to search for the combination of resources to minimise the adverse effects. Trial and error will even then the better strategy because society is in greater need of the opportunity benefits (Wildavsky, 1988a, p. 214).

Wildavsky considers himself a modified cornucopian. The cornucopian view promotes mankind's creativity, for which resources are manipulable, and what makes the world a richer and safer place. The opposite view, the catastrophist view, sees dangers in the depletion of non-renewable resources, irreplaceable damage to the natural environment, envisaging ecological disasters deeply damaging to human life (Wildavsky, 1988a, pp. 215, 216). Wildavsky (1988a, p. 216) considers these as rival concepts of capitalism (cornucopian view) vs rejecting capitalism (catastrophist view). As a modified cornucopian, Wildavsky explains that he believes that the consequences of technological progress will make life safer but that a qualitative surprise to human life may well occur. However, this will be the same when taking a catastrophist view. Because, as he further explains, the uncertainty principle identifies that consequences and interactions among past and current undertakings must, to a large amount remains indefinite. Thus, being alert and being capable to deal with the surprise is of the essence (Wildavsky, 1988a, p. 216). To be able to do this, Wildavsky argues, it is desired to accumulate general global resources (wealth and knowledge) that can be used in case of emergency. He points out that:

> "The importance for safety of convertible resources gives a new dimension to processes that create and expand wealth: these aid in the search for safety by maintaining a redundancy of means and a varied repertoire of responses to unpleasant surprises" (Wildavsky, 1988a, p. 216).

The role of individual rights towards risk taking is the next topic to be discussed. Wildavsky argues that safety is a discovery process upon which the rule of risks applies, the parts of the system must vary if one wants a stabilized whole. Thus, as the safety of the whole is the priority, the individuals making up that system will need to have a chance to improve their risk, meaning that risk must be shared amongst them (Wildavsky, 1988a, pp. 216, 217). Wildavsky argues that individual rights are not sacrificed when asking to take more risk if the safety of the society is to improve. He claims the contrary, rejection of risk would hamper the majority of individuals to carry out their plans. He uses the article of professor in law Christopher H. Schroeder, called 'Rights against risks,' to provide the arguments to support his claim. Schroeder's article is about:

> "The notion of rights against risk that trumps all considerations of countervailing values cannot so be validated by any theory in the rights traditions" (Schroeder, 1986, p. 510).

Schroeder refers to the 'Utilitarian' versus 'Kantian' traditions which the execution of the governmental power of the USA is based on. Utilitarianism considers risks worth to be taken because of the potential gains associated with them. They focus on the good for the whole not necessarily taken in the risk to the individual in the journey towards the good. This view comes back in in terms of weighing risks against potential gains (Schroeder, 1986, p. 505). The Kantianism (named after philosopher Immanuel Kant) considers the individual being the most important. The theories related to this view consider an individual as a free, autonomous and moral agent. They want to make the individual more secure than he/ she is under utilitarianism (the latter they accuse to prefer the whole over the part (individual) (Schroeder, 1986, pp. 509, 510). Schroeder argues that both theories have their pros and cons and suggests an alternative. He argues that utilitarianism does not sufficiently take the individual rights into account and that Kantianism ignores the rights of the risk creator and the benefits of the product the risk creator makes. The latter he calls the adverse consequences (Schroeder, 1986, p. 512). He proposes the following:

> "The competing claims of risk bearer and risk creator, each in their own right legitimate, must be compared with each other such that an increase in the urgency of one claim, ceteris paribus[90], will tilt the risk regulation towards the claimant" (Schroeder, 1986, p. 512).

Schroeder continues his argument in identifying that the answer lies in the distinction between the considerations relevant to formulating a rule and the considerations relevant to its application. He provides as example the rule that pedestrians walking on country roads must walk on the side of the oncoming traffic however by strict adhering to that rule other matters are not considered, like:

1) Terrain conditions,
2) The lay-out of the road, and
3) Various other situational distractions.

Schroeder argues that rules should therefore consider the consequences (including the adverse ones). "With this there is a valid distinction between weighting the consequences of a risky action and weighing the consequences of a rule regulating risky actions," says Schroeder. He also identifies that based on the benefit of the risk a weighing must be made. For instance, an unintended leakage of a carcinogenic chemical from a chemical plant can be differently considered when the chemical in question is the main ingredient for a medicine helping a large majority of people having a better life, than when it is for the production of a toy. With this, Schroeder claims, it is clearly that consequences matter and that they actually override risk reduction benefits in some cases of technological risk. He argues that: "the cost of distinguished cases favouring the risk creator from those in which the balance tilts the other way exceed the gains from making that discrimination, so that adopting consequences -invariant rights to apply to the entire class of risks is a superior strategy" (Schroeder, 1986, p. 517). Wildavsky (1988a, p. 219) concurs with Schroeder's line of thinking, because:

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[90] If everything else remains the same; other things being equal (*Ceteris Paribus*, 2023)

> "The safety we wish to promote and the harm we wish to mitigate are bound together. To talk as if one person's 'rights' to safety could be upheld without denigrating the rights of others falsifies most risk situations" (Wildavsky, 1988a, p. 219).

Wildavsky favours a strategy of resilience by increasing the global resources, since he argues, a relation exists between the well-being of a society and the damage suffered by the members of that society. He argues that this increase in global resources helped to battle AIDS since when this disease had appeared in the 1960s, and we had the same discussion about risks as we have now, the progress of molecular biology had been halted with all adverse consequences to find a cure (Wildavsky, 1988a, p. 221).

Wildavsky repeats his argument once more: Resources used to lower hypothetical future risks cannot be used for accomplishing other social goals who also could lower risks. He reiterates that hypothetical harms are limitless and that what makes it dangerous to spend a lot of money on them. With a view of hindsight bias, it is easy to claim the rightness of that expenditure, but the money spent to hazards that did not materialise is not spoken about (Wildavsky, 1988a, p. 220). A strategy of resilience does not mean waiting for a disease to strike before trying to respond to it, says Wildavsky, it means preparing for the inevitable, the appearance of a new qualitative surprise. Does this mean that there is no role for anticipation? Not at all: Wildavsky identifies that there is a very vital role for anticipation, to protect against risks whose potential for realization is substantial. "Thus, where risks are highly predictable and verifiable, and remedies are relatively safe, anticipation makes sense" (Wildavsky, 1988a, p. 221). His advice for a resilient strategy is to proceed incrementally with trial and error so that society can try out new innovations on a small scale, thus enabling it to better sample the unknown and to assess the risks (Wildavsky, 1988a, p. 221).

Wildavsky explains how to treat technological danger as to improve human health and safety. He recommends the following steps:

1) Ascertain whether and to what extent the alleged risk is real,
2) Assess the alleged risk with existing risks (ask one's self: compared to what?).

The latter to assess whether the introduction of the technological danger is less risky compared with the existing technological risks and also to determine, in case of a substitution, it is actually less

dangerous than the initial technological danger. Wildavsky argues that the following question, considered by him as the most complex one, still requires an answer: "Will the danger we know be replaced, displaced by others that are far worse in ways we do not know expect?" This question can best be answered, argues Wildavsky, by resilience, by means of trial and error because:

1) Increase in knowledge compensates for lack of society's imagination, and
2) There is an increase in general resources (wealth and knowledge) that can be utilised to battle future dangers.

Wildavsky points out that by asking questions, it implies that there appears to be answers. He argues that by asking what the optimal amount of safety is, that there is someone or institution (like government) already knowing the answer. Based on this, he argues, safety is considered as a condition that can be achieved by central design. Wildavsky argues by referring to the USA's constitution, that the latter includes a view that rejects that central authority knows best. There are some central anticipatory measures, he explains, like war and dealing with the currency to name but a few, but the security of the general welfare was left with the individual states. Wildavsky claims that this separation of power, and therefore also decentralisation of power and subsequent legislation, resulted in resilient institutions (Wildavsky, 1988a, pp. 222, 223).

The establishment of central agencies to deal with technological dangers, made their bias towards anticipatory measures extensive, argues Wildavsky (1988a, p. 224). He claims that the central agencies have the capacity to deal with repetitive large scale anticipatory efforts. They are attracted to do this, because they believe that their experts can outguess the future and because their ability to claim credit is linked to visible projects. Nonetheless, these policies are based on 'one size fits all.' The environmental standards fail to take into account local differences that affect the risk a given level of danger presents to a population, as Wildavsky highlights (1988a, p. 224). He argues that government should be allowed to make mistakes, it should not make a scandal if a government acted on judgement, which appears to be incorrect later on. It should be scandalous if they did not do anything to rectify the situation. In other words; trial and error in legislation (Wildavsky, 1988a, p. 225).

The reason why this is not in place is based on 'fear of regret,' as Wildavsky argues, it "enables those so disposed to claim that they have done all that conceivably could be done. No errors of omission remain: no catastrophes can be laid at their door" (Wildavsky, 1988a, p. 225). "The hidden anticipatory assumption is that the regrets we knowingly avoid are more worth than the regrets we implicitly don't know how to avoid or have gotten to accustomed to," as Wildavsky explains (1988a, p. 226).

Wildavsky claims that the 'fear of regret' the main barrier is for 'searching for safety.' Trial and error works to increase resilience because it is the most forceful search method in existence (Wildavsky, 1988a, p. 227). Wildavsky further claims that market competition, can overcome defects to enhance overall safety, not because they have the answer, but because there are other combinations that have a better result. Wildavsky continues his claim, by stating that if the competitiveness of markets increases, there will be different searches and more safety, specifically against the unexpected (Wildavsky, 1988a, p. 227).

Safety is thus a process of discovery, "since there are no objects or processes wholly safe under all conditions, and since there is always room for improvement, it is crucial to discover better combinations" (Wildavsky, 1988a, p. 227). His main problem to the current discussions of risk and safety is that they are partial, by concentrating almost entirely on the dangers of risk taking, whilst ignoring the opportunity benefits that would be gone by risk aversion.

Being the political scientist after all, he wants to have institutions (government) that encourage a search so strong that no one can be said either to have designed or controlled it. Wildavsky already concluded that safety is the outcome from a process of discovery. He identifies what this process entails: It is competitive and evolutionary. Furthermore, it is a trial-and-error process by wishing the end – safety, without providing the means – a decentralised search. If the latter is not in place, he claims, then the process is self-defeating, because:

> "Conceiving of safety without risk is like seeking love without courting the danger of rejection" (Wildavsky, 1988a, p. 228).

Appendix B – Critiques

This appendix provides an overview of the critiques per topic which had to be omitted in the thesis:

Book reception

"A great case study in risk management, perhaps the most comprehensive case study ever written" (Dorfman, 1990 p. 564).

"An important addition to the societal debate on risk" (Bradbury, 1989, p. 202).

"Much of the book is a scintillating polemic against those who would seek to eliminate the last molecule of every carcinogen or toxin from our air, water, soil and food," says Rayner (1990, p. 808).

"Searching for Safety is no less than a new and rival theory as to how safety may be achieved. Safety is, of course, always a relative than absolute condition" (Short, 1990, p. 181).

"The main message that economists have to offer with respect to risk regulation policies is the need for trade-offs. Searching for safety, the recent book by the political scientist Aaron Wildavsky, is primarily concerned with one aspect of these economic trade-offs – recognizing the importance of economic growth in promoting safety" (Viscusi, 1990, p. 1726).

"Searching for Safety is well researched and well thought out, well organised - though repetitive in places - and well written (Williamson, 1989, p. 64).

"Searching for Safety is an important book because it poses a serious challenge to much of the recent government regulation that attempts to protect us against the risks associated with modern technology" (Judkins, 1988, p. 663)

"The late Aaron Wildavsky's Searching for Safety is a bold, multifaceted statement about how to improve safety and health. Speaking from the vantage point of a period of unexampled technological change, it confronts the view that such change and the economic processes in which it is embedded are responsible for the generating grave social hazards even as they allay other, possible less grave threats (Rothenberg, 1993, p. 159).

Key Message – positive critique

"At one level Wildavsky's provocative essay in Political Economy is simply a polemic against regulation. At this level the economist has to agree with much of what he says: it is, after all, absolutely straightforward economics" (Collard, 1989, p. 114).

"Wildavsky's monograph is useful because the propositions are not widely accepted. Indeed, this work can provide a welcome balance in a class room setting" (Katzman, 1988, p. 557).

"Although Wildavsky has a tendency to create slogans and to shoot from the hip, he has a central point that is worthy of attention. Our emphasis upon what he derisively calls 'anticipation' leads us, because of our ignorance of future events, to bear opportunity costs that are unnecessary" (Stills, 1988, pp. 303-304).

Key Message –critique

"But anticipatory efforts are not made in a vacuum; they are tried where there is presumptive cause-and-effect evidence, or experience, to suggest that if particular kinds of cautionary actions are not taken, unfortunate events may well occur. Preventive actions may not be practicable for events far in the future, but they may be useful, for example, in putting in place monitoring systems and teams to predict the course of a hurricane days in advance, together with evacuation plans" (Rothenberg, 1993, p. 164).

At a rather higher level of debate Wildavsky presses the Hayekian notion that innovative capitalism is an efficient way of interrogating the unknown: the cost of failure is high for the individual but low for society as a whole (Collard, 1989, p. 115).

Among his more challenging arguments are these two: (1) that wealth is positively correlated with safety and that safety measures are inherently suspect because they may use up resources, and (2) that market mechanisms will often produce the greatest safety benefits for society. Thus, the book seems part of the contemporary, mainstream philosophy of deregulation" (Jasper, 1990, p. 89).

Omissions

"At the margin, Wildavsky does not demonstrate how increases in absolute wealth (as opposed to relative position in society) generates health, other than by enhancing the capacity to purchase medical technology, which he downplays. He also pays insufficient attention to technological advances such as enhanced diagnostics and improved pharmaceuticals. His neglect undercuts the complaint against exhaustive testing, which delays the release of innovative pharmaceuticals" (Katzman, 1988 p. 558).

"Thus, the direct costs of anticipatory intervention, in the form of less innovation, could through proper regulatory techniques, be reduced to quite tolerably low levels. Regulation would ideally consist in imposing differential charges on various private products and production processes that generate specific kinds of foreseeable damages. Such charges should be based on the best available information, with the dependability of predictions taken into account. The passage of time would allow corrections of these charges (Rothenberg, 1993, pp. 168-169).

"Moreover, Wildavsky is wrong in arguing that in the United States, the Food and Drug Administration basically adheres to a no-risk criterion for the acceptance of new drugs (224). The FDA actually approves many preparations that are only incompletely efficacious and have a variety of side effects" (Rothenberg, 1993, pp. 168-169).

"Wildavsky's favourite example of the effects on socialism on health, the USSR actually showed that health may worsen even while per-capita income slowly grows. Closer examination of the specific circumstances of individual countries makes that health depends on many particular features that are only weakly, or even negatively associated with the total income or wealth – such as the distribution of wealth, accessibility to medical care, nutrition, housing, public-health programs, liquor and cigarette consumption and cultural practices" (Rothenberg, 1993, pp. 168-169).

"Suffice to say that in Wildavsky's book the examples chosen are numerous and strong. Interpretation however is another matter" (Short, 1990 p. 184). "His resilience and fine-tuning argument assume that the short-term interests of corporations and corporate personnel are

compatible with the sort of trial and error that brings about greater safety, an assumption that has not often stood up to empirical inquiry" (Short, 1990, p. 187).

"The presentation would have been even more compelling for economists had he also included additional references to the more empirical research on this topic that has taken place in the economics literature" (Viscusi, 1989, p. 1726)

"Chapter 4 provides a discussion of the costs per life saved from various governmental policies. However, since this material is based on his citation of previous surveys. 'Of regulatory agencies' value of life that were published more than a decade ago and were based on regulations promulgated even earlier, it does not provide as up-to-date a treatment of these issues as is available elsewhere (Viscusi, 1989, p. 1727).

"Wildavsky does not demonstrate how increases in absolute wealth (as opposed to relative position in society) generates health, other than by enhancing the capacity to purchase medical technology, which he downplays. He also pays insufficient attention to technological advances such as enhanced diagnostics and improved pharmaceuticals. His neglect undercuts the complaint against exhaustive testing, which delays the release of innovative pharmaceuticals" (Katzman, 1988, p. 558).

"While the book is comprehensive and rigorous, it is flawed by what seems to be an occasionally casual use of facts, or omission of relevant facts, in order to make the author's point" (Jasper, 1990, p. 89). *(Jasper points out that the example used of the jogger was an actual runner who refused a stress test where his dangerous condition could have been detected. If he had not refused, the runner might still be alive; anticipation over resilience - ed.).*

"What Wildavsky fails to address, however – which is also a failure of many of the federal programmes he criticizes- are the questions of who is making the decisions about the risks encountered, and what are the 'parts' that will be put to risk. The problem is not with trial and error, per se, or with trial without error, for that matter; but who makes the decisions about who will at risk, who is likely to suffer the most from the risk taking, and who has control over the production and distribution of knowledge that is produced by either strategy?" (Judkins, 1988, p. 664).

"Although I suppose that Wildavsky and I probably recognize somewhat different versions of American history, I have yet to read an account which demonstrates that risks to health and safety have not been shared by the American public. If anything, many of the regulatory programs of the last two decades have addressed the extreme inequality of harm to the average American citizen, and particularly the industrial worker" (Judkins, 1988, p. 664).

"He goes too far however in arguing that since the 'combination of the principle of uncertainty' and the 'axiom of connectedness' actually explains what we observe - namely, that society gets safer despite the continuous introduction of new hazards - it must be that safety benefits of the new outweigh their associated dangers' (p.42). Many new hazards are not 'introduced' but 'discovered' by scientific study and by more careful monitoring of experience than has been possible in the past. Advances in health care and safety are attributable in large measure to such discoveries – discoveries that permit greater and more refined resilience and anticipation" (Short, 1990, p. 186).

Conclusion

"Ironically, his refusal to acknowledge any value at all in regulatory determinations of safety by hierarchies or the extreme protection of individuals sought by egalitarian collectives, runs counter to his own argument for societal resilience. Besides wealth, another source of societal resilience to risk may be diversity. The existence of many views of an issue or problem seems more likely to bring both dangers and solutions to public attention" (Rayner, 1990, p. 808).

"*Searching for Safety* is provocative, well written, timely and should be of considerable interest to readers of the journal" (Dorfman, 1990, p. 565).

"Wildavsky's work raises many important questions concerning how society ought to address risks. However, his conclusion that resilience nearly always is superior to avoidance is premised on assumptions and biases that are at least questionable, and at worst dangerous" (Short, 1990, p. 185).

"Admittedly it is not always clear what one should do when balancing safety against wealth, but trial and error cannot be an adequate strategy when the damage done by individual agents (companies) is large in relation to the system as a whole. Neither can it be adequate when the effects of individual

error are cumulative (though not severely) dangerous. The design of regulations for these huge important cases is more important than simply inveighing against them" (Collard, 1989, p. 115).

"This book can make an important contribution to enriching the quality of decisions about safety. I hope it will be widely read, and even more widely discussed" (Jasper, 1990, p. 90).

"It is a book that will be of interest to philosophers engaged in exploring the unreality and hubris of the contemporary mind in yet another of its fascinating permutations, as well as to political scientist and serious journalists embroiled in a loud and vigorously waged public debate" (Williamson, 1989, p. 64).

"Wildavsky makes a strong if polemical case for resilience over anticipation" (Sills, 1988, p. 304).

"Despite these criticisms, Wildavsky makes a significant contribution to the study of risk, technology, and environmental and occupational health and safety. By conceptualizing the debate in terms of risk taking versus risk aversion, he provides a framework for both further theoretical and empirical work. One can only hope that those who choose to follow his search for safety will do so within the context of a search for justice and equality" (Judkins, 1988, p. 664).

The political economy of safety is poorly developed. Wildavsky is an important player in its development, as are others who view matters from more centrist or left-of-centre perspectives" (Short, 1990, p. 187).

"It is provocative and thoughtful and would be very useful for both graduate and upper-level undergraduate courses in policy studies" (Bosso, 1989, p. 1019).

Appendix C – Wildavsky's vocabulary

This appendix provides a structure to Wildavksy's vocabulary since the meaning of the used terminology may differ from the regular definitions used in the safety discourse (Table 12).

Table 12

Wildavsky's vocabulary

Definition	Wildavsky's explanation
Safety	A process of discovery, since no objects or processes are wholly safe under all conditions, and since there is always room for improvement, it is crucial to discover better combinations
	A product of the accumulation of general resources (wealth, knowledge, energy, communication) that can be converted into what we need when we need it.
Resilience	Large numbers of frequently adjusted small errors allow testing of new phenomena before they become too big to cause harm
	The capacity to use change so as to better cope with the unknown; it is learning to bounce back
Economics of safety	Opportunity costs and opportunity benefits
Opportunity costs	Those different goods that otherwise might have been purchased with the same resources
Opportunity benefits	Those opportunities to reduce existing harms that society forgoes when it decides to delay or deny the introduction of a new substance or technology
Risk	The variance of the probability distribution over the utilities of all possible consequences
Anticipation	A mode of control of central cognition; potential dangers are averted before damage has done

Appendix D – Grid-Group, Cultural Theory and Egalitarianism

This part will address the grid-group theory as developed by Mary Douglas in 1970 (Douglas, 2003). An explanation of the grid-group / cultural theory will be first provided, followed by the application of it, paired with an assessment of *Risk and Culture*, to understand why Wildavsky conceives the subjective aspects of safety as the "variable perception of danger."

The grid-group theory was an idea included in Mary Douglas' 1970 book *Natural Symbols* (Douglas, 2003). This book was the sequel to the seminal 1966 book *Purity and Danger* (Fardon, 1999, p. 80). Douglas explains in an introduction lecture, covering the history of grid and group cultural theory, that the latter was used "to dismantle intellectual barriers assumed to distinguish 'them' and 'us' in anthropology." She explains that her book showed that famously primitive concepts of pollution and taboo were with 'us' (Western society) as much as with 'them' (the then considered natives or primitives) (Douglas, 2007, p. 1). She encountered sociologist Basil Bernstein who argued that her approach was too universal and suggested to use his just started work of weak and strong classifications on family relations, to come to a typology of cultures. Douglas produced a rough typology with the emphasis on the division of labour and the organisation of work in *Natural Symbols*. "This emphasis on classification was the first to be dropped," Douglas explains, that what is required to derive to a typology of cultures are two dimensions: 1) Group (meaning a general boundary around a community) on the X- axe, and 2) Grid (regulation) on the Y-axe (Douglas, 2007, p. 2) (Figure 13).

Figure 13

Grid-Group Diagram

Isolate	Positional / Bureaucracy
Individualist / Market	Enclave / Religious charisma

Douglas explains her first version of the grid-group diagram as follows:

> "The group dimension measures how much of people's lives is controlled by the group they live in. An individual needs to accept constraints on his/her behaviour by the mere fact of belonging to a group. For a group to continue to exist at all there will be some collective pressure to signal loyalty. Obviously, it varies in strength. At one end of the scale, you are a member of a religious group though you only turn up on Sundays, or perhaps annually. At the other end there are groups such as convents and monasteries which demand full-time, lifetime, commitment. Apart from the external boundary and the requirement to be present, the other important difference between groups is the amount of control their members accept. This is supplied on the other dimension: grid gives a measure of structure. Some peoples live in a social environment where they are equally free of group pressure and of structural constraints. This is the zero start where everything has to be negotiated ad hoc. Moving along from zero to more comprehensive regulation the groups are likely to be more hierarchical. Put the two dimensions together, group and regulation, you get four opposed and incompatible types of social control, and plenty of scope for mixing, modifying or shifting in between the extremes" (Douglas, 2007, p. 3

Douglas (2007, p. 3), further explains that Max Weber's[91] three types of rationality: 1) Bureaucracy, 2) Market, and 3) Religious charisma, are collectively three of the grid-group cultures, namely: 1) Positional, 2) Individualist, and 3) Sectarian enclave.

[91] Max Weber (1864- 1920) was a German sociologist and political economist. He is best known for his thesis of the "Protestant ethic," relating Protestantism to capitalism, and for his ideas on bureaucracy (Mitzman, 1998).

Taken this into account, the grid-group has the following characteristics per group identified (Table 13).

Table 13

Explanation first version Grid-Group Diagram

Grid- group culture	Characteristics
Positional (hierarchical)	A society which all roles are described; all behaviour governed by positional rules. This kind of society sustains itself with a cosmic theory of a hierarchical universe; (Douglas, 2007, p. 5).
Enclave	A kind of community that also features a strongly bounded group. It has no ranking or grading rules for the relations between its members. It would be suitable for a community of dissidents. A sect might be placed here. It tends to be egalitarian because it repudiates the inequalities of the rejected outside world (Douglas, 2007, p. 5).
Individualism	A society, which by definition is weak in both group as grid controls. The main form of control is competition. Dominant positions are open to merit. Max Weber's commercial society fits in: the individual is solely concerned with private benefit. It is an egalitarian society but as it defers to wealth and power, it fails to realise its egalitarian ideals (Douglas, 2007, p. 6).
Isolate	This 'society' has strong grid controls, without any group membership to sustain individuals. Anyone who arrives here is a cultural isolate (Douglas, 2007, p. 6).

This version, as indicated by Douglas, initially emerged from her studies into African ethnography as "a way to understand the distribution of cults, demons and witchcraft needed to be made ready for the modern society" (Douglas, 2007, p. 6). Various scientific disciplines refined this initial 'Mark I' model to make it suitable in political science, mathematics, and social science. Amongst them was also Aaron Wildavsky, who made a central contribution to the development of the cultural theory: the successor of the aforementioned grid-group theory (Douglas, 2007, p. 7).

Douglas' grid-group theory was a life changer for Wildavsky. It provided him a means to understand the change in response to the use of nuclear energy: where in the 1940s and '50s, the public was in favour, the 1960s and '70s saw the opposite: the public was in anger and revolted against it, they were against the use of nuclear energy because of the environmental impact and its intrinsic dangers. Wildavsky put a lot of effort in the development of the cultural theory framework during the 1980s and early '90s. (Lockhart & Coughlin, 1998, p. ix). The cultural theory framework provided for him a universal theory that he used as a starting point for his various contributions to a wide variety of subjects, the change of opinion in the nuclear debate one of them.

Douglas and Wildavsky collaboratively modified the grid-group culture theory into the 'cultural theory of risk,' or in short, 'cultural theory.' This thus evolved to a more integrated idea of the relationship between social organisation and culture. To make the theory useful for politics, a third dimension was added, with the aid of Michael Thompson "to indicate the scope for individual manipulation" (considered by Douglas as a power dimension) (Douglas, 2007, p. 8). Another type of society was added at the crossing of the axes in the diagram: "the 'hermit:' the reclusive person who survives without social ties," as introduced by Douglas (2007, p. 8), by this more options for the typology for cultures could be created.

The aforementioned Thompson collaborated with Wildavsky in the late 1980s and early '90s. This collaboration resulted in a much-modified cultural theory that let to grid-group theory becoming obsolete. They examined the relationships between cultures within the same community and identified that a community includes several cultures, with each of them being defined by the contrast with the others.

People with a shared culture keep 'their fire burning' by blaming the other cultures with moral failure (Douglas, 2007, p. 8). The cultural theory assumes that four types of cultural bias are normally

present in any society. Each is based on a type of stable organisation that could not endure if the cultural foundations of their organisation would become craggy. Therefore, all four will be at 'war' with each other, except for the 'hermit' since it has no social ties (Douglas, 2007, p. 8). This is included and further explained in the book *Cultural Theory* (Thompson, Ellis & Wildavsky, 1990).

The foundation for the 1990 *Cultural Theory* book was established about ten years earlier by the aforementioned 'cultural theory of risk' by Douglas and Wildavsky. They considered this theory as "the social environment, the selection principles and the perceiving subject combined in one system without ignoring the reality of the dangers around" (Douglas and Wildavsky, 1982, p. 7). It is based on the "assumption that any form of society produces its own selective view of the natural environment which influences its choice of dangers worth attention" (Douglas and Wildavsky, 1982, p. 8). Douglas and Wildavsky explain that real dangers are only known after these have been materialised. In the meantime, one must act in the here and now to ward off harm. Each type of social life will prioritise their dangers, some higher, and others lower, because of their cultural bias. As Douglas and Wildavsky further explain: This is integrated into the social organisation, which negotiates by risk taking, or by risk aversion, the best way to organise social relationships. Thus, if there is a certain type of society biased towards emphasising the risk of pollution, it is not that other types of society are unbiased, but instead, have another bias towards risks they emphasise for their cultural settings (Douglas and Wildavsky, 1982, p. 8).

Douglas and Wildavsky argue that people select their awareness of certain dangers to conform with a specific way of life. The latter presumes that people do follow different types of social organisation and therefore are willing to take risk or to be risk averse governed by this. Douglas and Wildavsky, (1982 p. 8), argue that to change risk selection and perception, one has to change the social organisation.

They point out that:

> "Questions about acceptable levels of risk can never be answered just by explaining how nature and technology interact. What needs to be explained is how people agree to ignore most of the potential dangers that surround them and interact so as to concentrate only on selected aspects (Douglas and Wildavsky, 1982, p. 9).

Risks are in "man's intervention in the natural world," thus being beyond a person. Acceptability is inside a person, in its mind. To connect the two, it is reasonable to assume that one should connect the dangers of technology and people's perception of those risks. Douglas and Wildavsky disagree with the aforementioned assumption and argue that the only way to connect these two, is not by claiming the added value of technology or by claiming that perceptions are subjective, but only by "a cultural approach that can integrate moral judgements about how to live with empirical judgements about what the world is like" (Douglas and Wildavsky, 1982, p. 10), meaning that an anthropological view could connect the two.

Douglas and Wildavsky (1982, p. 10), claim that the reason of why the "source of safety, science and technology, have become the source of risk," is because of "a complex historical pattern of social changes has led to values that are identified as 'sectarian' being more widely espoused." Therefore, Douglas and Wildavsky wanted to understand the social forces that represent the environmental protection in America (Douglas and Wildavsky, 1982, p. 186). Douglas and Wildavsky try to come to an understanding by addressing the following topics in the book:

1) Analysing the argumentation that connects modern technology with environmental decline by defining that the risks are hidden, involuntarily and irreversibly,
2) Proving that risks are socially selected by comparing 'modern' views with 'primitive' ones,
3) Arguing that there is no uniform scientific view on risk,
4) Claiming that risk assessments are not helpful since these are subject to biases of social assumptions, and
5) Pointing out that each culture, and each set of shared values and institutions are biased, hence will emphasise certain risks and consider other risks as less important.

They conclude by providing an explanation of what they call "the puzzling phenomena: the rise of alarm over risk to life at the same time as health is better than ever before" (Douglas and Wildavsky, 1982, pp. 14, 15).

The Western society, as Douglas and Wildavsky claim, usually reverts to a typology of a bureaucracy contrasted with the market hereby referring to the USA and Western Europe. Based on the group-grid theory; a positional / hierarchical versus market / individualistic typology. Douglas and

Wildavsky argue that these are the centre of the society, whereas at the border of the society, a sectarian layer can be defined (Douglas and Wildavsky, 1982, pp. 10, 90).

The culture of hierarchy includes churches, industrial corporations, and political hierarchies. Their success depends on not allowing one-member's personal glory to be distinguished from the collective honour. Vice versa, no individual can be forced to take blame. Collectivising responsibility is done by making roles anonymously. Douglas and Wildavsky citing hereby Karl Mannheim,[92]: "A type of organisation that turns all policy issues into administrative manners." One can consider it as a large oil tanker that requires time to adapt to changes. Control of the future is done by process and subsequent procedures and appears to be stable, but it cannot perceive the unexpected (Douglas and Wildavsky, 1982, p. 95).

The opposite culture, the culture of the individualists, is considered as the individuals being entrepreneurs seeking to optimise at the margins of all his transitions. To do this, a level of autonomy is required not only for the individual self, but also for all other individuals. Everyone has the right to contract or withdraw from such contracts as long as these practices are accepted by the first mentioned. Such a society would use a government to make rules for fair play, protection of contracts, and setting standard measures (Douglas and Wildavsky, 1982, p. 95).

Despite these differences, both types of culture have a shared view about danger. They prioritise threats that might affect the whole system and are sensitive of the public's confidence. Both cultures reasonably expect these threatening dangers in the long term. Douglas and Wildavsky (1982, p. 97) explain that both cultures, considering the differences in approach, have many similarities so that when both are negotiating mitigations to lower the danger, the general public's interest might be overlooked. They provide an example of negotiations for clean air between a governmental organisation (hierarchical) and coal burning plants producers (individuals), because the general public wanted clean air. This resulted in

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[92] Karl Mannheim (1893-1947) was a Hungarian sociologist. He is remembered for his "sociology of knowledge" and for his work on the problems of leadership and consensus in modern societies (The Editors of Encyclopaedia Britannica, 1998)

an agreement on a nation-wide emission ceiling that protected markets, (along other agreements made), with a focus on a reduction of greenhouse gas X, whilst Y was more dangerous and was not considered in the negotiations, hereby overlooking the ordinary public (Douglas and Wildavsky, 1982, pp. 97, 98).

Both the hierarchy and individuals' culture are considered to be central institutions. The border view is more related to sectarianism (Douglas and Wildavsky, 1982, p. 102). By which, sectarianism is meant the people at the border gather in groups to shunt the power and influence of the establishment (the centre). They appeal towards the idea of the evil outside as a theological image which they use to justify their estrangement from the established orders (Douglas and Wildavsky, 1982, p. 102). Sectarianism has, in its view, three positive main ideals:

1) Human goodness,
2) Equality, and
3) Purity of heart and mind.

The threats towards sectarianism are:

1) Worldliness, and
2) Conspiracy.

The former can be translated into large organisations, big money and market values, the latter can be translated as the concealed technological impurity invading nature and the body of man: The modern counterpart of witchery (Douglas and Wildavsky, 1982, p. 10), the recent debates about nuclear energy and chemicals (e.g., PFAS) (to name but a few) are considered examples of this.

This sectarianism has grown in the USA since the 1960s onwards. Douglas and Wildavsky acknowledge that sectarianism has been present in the USA since the first settlers. These had fled Europe to escape religious prosecution. Different views split these groups into new type of religious groups. Their common theme was an apocalyptic view where evil lurked with a purpose to destroy mankind whereafter heaven was promised when evil was banned. Douglas and Wildavsky explain that since the founding of the separate states of America, there has never been a worry about a strong hierarchical political centre. This centre was non-existent for a while, and when it was actually founded, there was a lot of freedom

included in the constitution towards individuals. This was a result of the fear of a too strong central authority (Douglas and Wildavsky, 1982, pp. 153, 154).

The rise of the large corporate organisation (an outcome of the industrial revolution) in the late 1900s, resulted in two complementary movements:

1) Increased participation in politics, and
2) Protection of the environment against industrial exploitation.

The first movement was an attempt to make politics more open to the public by using ballots to vote over new legislation, and the use of recall (a way to dismiss politicians before their term had ended if their performance was considered poor). The second movement's main concern, and biggest issue, was the fact that the USA had ran out of wilderness. This was the time that the National Parks were founded to protect the remaining wilderness (Douglas and Wildavsky, 1982, pp. 154, 155).

During the start of the 20th century with two World Wars, an economic depression in their midst and fear of communism after WW II, the role of the USA central government was strengthened and had little opposition other than the rivalry between the two main political parties: the Democrats and the Republicans. The opposition to existing institutions in the USA has always had two cultural sources:

1) Hierarchy, and
2) Sectarianism.

The first cultural source is prepared to take over by replacing the existing hierarchy for, in their view, a better one. The second cultural source challenges it without any purpose to replace it (Douglas and Wildavsky, 1982, p. 157). The second cultural source became more and more powerful in the USA.

Douglas and Wildavsky (1982, p. 159) argue that the reasons that sectarianism has grown stronger is related to three topics:

1) The post-WW II generation (then a large proportion of the USA majority population) were receiving a higher education than before or compared with Western Europe or Japan,
2) The USA had a significant racial minority, and

3) This racial minority became political conscious whilst the children of the majority were busy with competing with each other in college or university hereby not considering the gap in equality with the minority.

Furthermore, where European nations were building up their economies and restoring societies again after their devastation during WW II, the USA had already a leading economy running. This is used by Douglas and Wildavsky as arguments to explain the earlier start of social concern in the USA. The economic growth resulted in better starting conditions for the post WW II generation.

By the mid-1960s most high school graduates of the racial majority enrolled in higher education which were exceeding the levels in Western Europe and Japan. The USA produced more educated people than could be handled by its production industries. Because of the economic growth, the government expanded, as did the new service sector, which resulted in a new type of jobs related to arts and social sciences, to name but a few. Douglas and Wildavsky (1982, p. 160) further explained that the economic boom and the education boom produced a group of communicative people with no obligations to business or type of industry which on an average had a higher education than the 'old skool' captains of industry. Douglas and Wildavsky argue that the service industry catered for educated people at the border, since "the more the means of production are ideas rather than things, the less the hierarchical organization of production appears essential" (Douglas and Wildavsky, 1982 p. 160), thus by being further away from the centre (things in the actual production process), thrifting towards the border, the 'things' become more conceptual (ideas), hence a physical production oriented organisation structure is no longer required.

Whereas earlier it was indicated that two World Wars and economic crisis had strengthened the US central government, the Vietnam war did the opposite, as did the Watergate scandal[93] in the early 1970s. Douglas and Wildavsky consider this war as a defeat for the USA, and a failure to its institutions

[93] The Watergate scandal was a series of interlocking political scandals of the US President Richard M. Nixon's administration. The scandal included a break-in at the Democratic National Committee (DNC) headquarters in the Watergate complex in Washington, D.C., on June 17, 1972, and subsequent cover-up by people who worked for or with the White House, and by Nixon himself (Perlstein, 2023).

both militarily as morally. The loss was considered a retribution for the immoral institutions that had led the war. The Watergate scandal further strengthened the belief that, in general, institutions were not to be trusted. At the same time period, the racial minority was struggling for their civil rights in the USA. Douglas and Wildavsky explain further, that based on the civil rights movement way of working, and their preference for having only their own minority members representing them, majority members who helped them with their cause were discarded. Suddenly they had time on their hands and with a remaining belief of injustice: The public interest groups were born. These groups focussed on the environmental problems by combatting these with the same tactics as deployed by the anti-war and civil rights groups before: non-violent protest and non-negotiable demands (Douglas and Wildavsky, 1982, p. 163). The reason that the focus from the public interest groups was on environmentalism is that this became an important topic because of increased political participation as well as by politicians pleasing the voters (i.e., the presidential elections of 1972 and 1976). All of this combined resulted in the growth of sectarianism from the early 1970s onwards (Douglas and Wildavsky, 1982, p. 162).

These public interest groups were able to become big because of:

1) Use of new technology: Mail-order memberships, and
2) Opportunities for support generated by the American government.

Douglas and Wildavsky (1982, pp. 164, 165) argue that the use of mailing lists has provided income for sectarian groups from large number of people who wanted to fight the environmental cause without too much trouble. Due to this, only a small group of dedicated people were doing the actual work. Because of their believe in the cause, these people accepted a low income, hereby providing experienced but inexpensive lobbying services for the public interest groups and hereby increasing sectarianism in the USA. The opportunities for support by the American government are related to the US tax rules. These are the link between the central government and the public interest groups: The public's contributions towards the public interest groups are tax deductible. By using law and lobbying, preferably both, public interest groups become more important. By central government provided subsidies, research grants, and attorney fees, the border actually gets the centre to allocate funds for its

border objectives. Douglas and Wildavsky (1982, p. 167) therefore conclude that the USA has become a border country:

> "The weakening of all integrative institutions designed to mediate between the citizen and the state – political parties, trade unions, churches – on a broad basis across a spectrum of issues, and the strengthening of single-issue special interest groups, is attributable, we suggest, to the rise of sectarianism" (Douglas and Wildavsky, 1982, p. 173).

The three institutional types discussed:

1) Hierarchical,
2) Individualism, and
3) Sectarianism

all have their part in public decision making with their own theories on how society should be organised as well as an explanatory philosophy to justify it (Douglas and Wildavsky, 1982, pp. 174, 175). The sectarian view in particular does not accept inequality in any form, whilst the individualists view does, as long there is 'turbulence' for competition. Hierarchy aims for stability. The pull and push between the different typologies keep the typologies alive and prevent a dominant typology (Douglas and Wildavsky, 1982, p. 180).

All three institutional types have thus their own typology for risk which is based on their own world view. Douglas and Wildavsky (1982, p. 184), argue that the public interest groups (sectarianism) therefore strive for safety because risk, like worldliness, is an ideal target for criticism: It is immeasurable, and its unacceptability is unlimited. Sectarianism is thus highly risk averse and favours anticipation.

Douglas and Wildavsky further argue that the changes we, the Western society, fear is because they are irreversible: "They cannot be undone and are as such impactful thus affecting society as such that government is expected to regulate these in favour of society" (Douglas and Wildavsky, 1982, p. 21). The Western society is a modern society that has embraced science as the source of explanations and threats, hereby replacing God. Nature is being considered the grand controller and seen as the best next thing to God (Douglas and Wildavsky, 1982, p. 21).

Appendix E – Symposium proceedings

An excerpt of the last chapter 'The Secret of Safety Lies in Danger' from *Searching for Safety* was used as a leitmotiv in this symposium on environmental politics called 'Risk, Safety and Capitalism' which was published in 'Social Science and Modern Society Volume 27, Number 1 November/ December 1989.' A variety of contemporaries critiqued Wildavksy's key message (Wildavsky, 1989a). Wildavsky ends the symposium by replying to these critiques, which provides a further insight into his point of view (Wildavsky, 1989b).

Since the publisher of the book and the journal are one and the same, a conclusion may be drawn that the symposium was used as a means of promotion for *Searching for Safety*, hereby also taking in consideration the advertisement for the book in the same journal (Wildavsky, 1989a p. 5) (Figure 1).

The symposium produced the following articles (Table 14):

Table 14

Symposium articles

Name of Article	Author
The Secret of Safety Lies in Danger	Wildavsky
Choosing Which Danger to Risk	Catton jr.
Safety through Markets	Viscusi
Regulating the Deregulated	Rothe
The Criteria of Net Benefit	Paehlke
Intelligent Planning for Safety	Ehrlich & Ehrlich
Capitalism is Richer, Democracy is Safer	Clarke
Extending the Search for Safety	Gaskins
Ghastly Science	Byrne and Martinez
Informed Consent	Reed
Thanks for the Commentary: Replies to Critics and Critiques	Wildavsky

The key message of Wildavksy (similar as the book and article), is that richer is safer. He argues that health and safety are a function of our standard of living. He further argues that bad things that we never suspected are bound to be happen, thus huge expenditures on preventive measures are likely to be mistaken, costly and counterproductive and will leave us not only sicker but also poorer (Wildavksy, 1989a, p. 4). He points out that the best process known to mankind to learn from our mistakes is the decentralised, trial and error system of people led coordination of capitalism. To make his point further, he compares the health and safety records of (the then) Soviet Union and Eastern Europe with the Western industrialised democracies and concludes that the latter "must have been doing something right for health" (Wildavksy, 1989a, p. 4). He acknowledges that every new product, process or chemical may harm someone. But, as Wildavsky's counter arguments goes, if new harms were piling atop of old harms, then the youth of America would have collapsed all over the place. Apparently, this is not the case, since life expectancy remains increasing, one should ask how America, along with other capitalist countries, have improved their citizen's health to prevent the inadvertently damaging of the processes that made this possible (Wildavksy, 1989a, pp. 4, 5).

The counterpart of resilience, anticipation (know what, know when, know how) is only to be used, as Wildavsky explains, if the available solution to mitigate the presenting problem's harm is desirable. He argues that this is most of the times not possible, hence his preference for resilience: a vigorous program of trial-and-error technological developments. Wildavsky concludes that Western nations have indeed the risks stemming from these opportunities, but the benefits have outweighed the harm, ergo: the net result has been better health.

It must be noted that any form of nuance, as provided in the book, is omitted in this 2-pager article: Wildavsky did start the symposium with full force.

Only a few of the symposium critics have taken the effort to read *Searching for Safety*, the majority of the reviewers did focus on Wildavsky's article. The article clearly did work as a red rag to a bull, considering the critiques, or as Wildavsky refers to it as "running against the tide of opinion" (Wildavsky, 1989b, p. 31). The critiques of the above articles are listed per author in the following paragraphs.

Catton jr. accuses Wildavsky of neglecting Type 1 errors,[94] and to have fallen into the trap of a type 3 error[95] when Wildavsky is playing down the risk of CO_2 production: a true catastrophe but of low probability. Catton argues, hereby quoting economist Talbot Page, who states that "a 'failure to find' is not the same as a 'finding of no effect,' or in other words: the fallacy of false negative(s). Catton jr. critiques that this fallacy is all over Wildavsky's book (Catton jr. 1989, pp. 7, 8; Wildavsky, 1988a).

Wildavsky finds with Viscusi a supporter in the operations of the markets to improve health and safety. The latter argues that the emergence of government agencies in the promotion of health and safety had no statistically significant beneficial effect on safety which the environmental legislation did since there can be no voluntary market transactions between firms and pollution victims. As Viscusi highlights, regulation can be extremely effective in such situations (Viscusi, 1989, p. 9). He concludes that in the Western industrialised countries, the market will remain the main force for promoting health and safety in our economy but that there is also a legitimate role for government intervention. He further concludes that a risk-free society is not attainable or should be an objective. More balanced health and safety environmental policies are important which include informational efforts like risk communication programmes from the government (Viscusi, 1989, p. 10).

Rothe disagrees with Wildavsky's view regarding deregulation and points out that the outcome of deregulation of truck drivers resulted in a decrease in safety, because the newly independent truckers were at the mercy of shippers and freight line leasing divisions resulting in rates plummeting down. To compensate for this, longer working hours, breaking of speed limits and lesser maintenance of the truck became the new normal. All of these topics decreased safety. Therefore, government intervened by regulating again to increase safety in truck driving (Rothe, 1989, pp. 11 ,12).

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[94] Type 1 error: Rejecting true hypothesis that certain products of industrial life are serious harmful to the health of humans or ecosystems (Catton jr. 1989 p. 7, 8).

[95] Type 3 error: Obscuring a more profound problem by preoccupation with al lesser issue (Catton jr. 1989 p. 7, 8).

Paehlke agrees with Wildavsky's view that richer is better and healthier than poorer. But "why is the wealthiest nation not the healthiest by many measures," he queries (Paehlke, 1989, p. 13)? He further put question marks around Wildavsky's net benefit. It has its own problems when being applied, claims Paehlke. He identifies three main problem areas:

1) are environmental costs not to be considered as benefits to the economy,
2) how to determine the price on natural beauty, human health or sense of comfort regarding future generations, and
3) who counts and who sets the price on a typical (random) life? His unanswered main questions are how it is decided upon what is 'net benefit,' and how is dealt with uncertainty and / or irreversible large-scale risks (Paehlke, 1989, p. 14)?

Ehrlich and Ehrlich disagree with resilience by means of trial and error. They argue that anticipation is the way forward and argue that various trends were already predicted before those arose hence one can plan for the inevitable (statements made with the benefit of hindsight, as one might observe when reading the article). When considering CT, one can clearly identify the critique of Ehrlich and Ehrlich as radical egalitarian. Capitalism is blamed, as well as Wildavsky's attitude and view, since the latter could even lead to an end of civilisation they argued (Ehrlich & Ehrlich, 1989, pp. 15, 16).

Clarke is more aligned with Wildavsky's view and promotes capitalism as an ideology. Clarke considers capitalism as being a structure or set of conditions that helps to account for how society works (Clarke, 1989, p. 17). He disagrees with Wildavsky about market mechanisms. Clarke argues that market mechanisms sometimes provide safety but cannot be considered to be a guarantee for well-being. Clarke argues further that not unbridled capitalism has resulted in health and safety, but social conflict over hazards. Regulation have helped to reduce these hazards and were forced upon markets and their profit-driven objectives. These regulations however could have been more stringent, but as it turns out, regulators and policy makers work in industry's favour more often than not (Clarke, 1989, p. 17). This has created distrust and conflict when making important choices among risks: Organizations and professions usually win. Therefore, in Clarke's words, "safety is enhanced, not inhibited, when people complain about policies and decisions that expose them to risks, they had no role in constructing." In any case, he points

out, "we should be arguing about how to make society safer, and about the continual reproduction of prevailing definitions of safety." (Clarke, 1989, p. 18).

Gaskins' article is the largest article of the symposium and shows that he is not in agreement at all. He opposes Wildavsky's neo-conservatist view, omissions in distribution of risk and the 'unknown unknown' risks (unforeseen risks), as the following excerpts show (Table 15).

Table 15

Gaskins's critique

"By drawing exclusively on aggregate concepts of economic welfare, Wildavsky ignores the economic and ethical questions that arise from the freakish distribution of social costs connected with environmental danger" (Gaskins, 1989, p. 20, 21).
"Wildavsky's argument can be analysed on the levels of rhetoric, economic logic, and institutional design". In rhetorical terms, Wildavsky frames his entire argument by using the old lawyer's gambit of shifting the burden of proof onto his opponents" (Gaskins, 1989, p. 19).
"Wildavsky wants to place the entire burden of uncertainty on proponents of regulation, requiring them to demonstrate the magnitude of potential harms, the probability of their occurrence, and the likelihood that interference in the market-defined status-quo will 'leave us better off" (Gaskins, 1989, p. 19).
"Wildavsky never poses the central economic issue: whether we have paid too dearly for the undeniable benefits of capital institutions. What about the health and safety of future generations? Will capitalism remain an unqualified success up to the very day it blows itself apart" (Gaskins, 1989, p. 20)?
"Wildavsky has simply not addressed the critical problem of immeasurability of unforeseen risks" (Gaskins, 1989, p. 20).

The article by Byrne & Martinez is a continuation of the critique as provided by Gaskins. It attacks the 'capitalist myth,' and highlights the downsides of progress by providing examples that show the adverse effects as well as the inequal distribution of risk within the USA. Both authors blame the capitalist development for that (Byrne & Martinez, 1989).

Reed looks to a different topic: Trial and error. Where do we draw the line between protecting individuals and nurturing adaptive and innovative risk taking, Reed (1989, p. 25) asks himself? 'Informed consent,' should here be the way forward. He explains that "this means that people exposed to risks inherent in experimentation must understand the nature of the trade-off, the risks and benefits of generally accepted practice, as well as those of the experimental treatment" (Reed, 1989, p. 25). To ensure that the experiments are properly controlled, he proposes an 'intelligent review committee.' He discusses the pros and cons of this and highlights the ethical difficulties of this informed consent and concludes that it requires further discussion (Reed, 1989, p. 26).

The symposium is concluded by Wildavsky with a response. This is also done with full force and also with wit (Wildavsky, 1989b). He starts with thanking Byrne and Martinez of validating the CT about their egalitarianist view on capitalism as the source of all evil (Wildavsky, 1989b, p. 28). He also thanks Viscusi for the opportunity to explain himself.

He gives praise to Clarke to come with a rival theory and agrees with the majority of his argumentation. He does not agree with the article of Roth, although the counter arguments provided by Wildavsky does not cover the critique that Roth has given (Wildavsky, 1989b, p. 29). He is thankful too to Catton jr.'s critique of Wildavsky's *Searching for Safety* being subject to the fallacy of the false negative. Wildavsky argues that the prevailing view is that it is better to find effects where there may be none than to find there are none where there actually may be adverse effects. Wildavsky claims "that the danger of false positives exceeds those of false negatives" (Wildavsky, 1989b, p. 29).

The critiques on his neo-conservative view, Wildavsky counters with wit by thanking Gaskins and Paehlke for making his life much easier since he now only has to consult his own neo-conservative psychology when he has to think about safety (Wildavsky, 1989b, p. 30).

The article of the Ehlrichs is discussed by Wildavsky as well, and there is clearly no love lost as Wildavsky writes that "at a time when some people appear to think that their love for humanity, expressed through their desire to protect the physical environment, entitles them to trash those who differ with them" (Wildavsky, 1989b, p. 30). Despite the opposite view, Wildavsky agrees with the 'gloom and doom' vision of the Ehlrichs: "Presently unknown bad things are bound to happen; they always have" (Wildavsky, 1989b, p. 30).

Wildavsky concludes the article with a counter critique towards Paehlke and Gaskins critique on the 'unforeseen risks.'

> "Where, then using experience as a guide, would readers place their confidence: in the belief that government will accurately predict previously unknown dangers such as AIDS and spend huge amounts effectively to prevent them, without huge losses from false positives, or that a resilient society will find ways to cope with and overcome difficulties as they arise, perhaps by creating a vibrant biomedical industry" (Wildavsky, 1989b, p. 31)?

Appendix F – Abbreviations

This appendix lists all used abbreviations in the thesis (Table 16).

Table 16

Abbreviations

Abbreviation	Description
ACSNI	Advisory Committee on the Safety of Nuclear Installations
AIDS	Acquired Immune Deficiency Syndrome
ALS	Amyotrophic Lateral Sclerosis
ASPA	American Society for Public Administration
BBS	Behaviour Based Safety
BSE	Bovine Spongiform Encephalopathy (Mad Cow disease)
COP	Conference of the Parties
COVID-19	COronaVIrus Disease 2019
CSE	Cognitive System Engineering
CT	Cultural Theory
ECHA	European Chemicals Agency
EHS	Environment and Health & Safety
EU	European Union
HRO	High Reliable Organisation (theory)
IARC	International Agency for Research on Cancer
MAC	Maximum Allowable Concentration
NASA	National Aeronautics and Space Administration
NAT	Normal Accident Theory
NPP	Nuclear Power Plants

Abbreviation	Description
OSHA	Occupational Safety & Health Administration
PFAS	Per-and PolyFluoroAlkyl Substances
PTFE	PolyTetraFluoroEthylene
QRA	Quantitative Risk Analysis
RE	Resilience Engineering
TLV	Treshold Limit Values
TMI	Three Miles Island
USA	United States of America
US	United States
USSR	Union of Soviet Socialist Republics
WTC	World Trade Centre
WW II	World War II

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